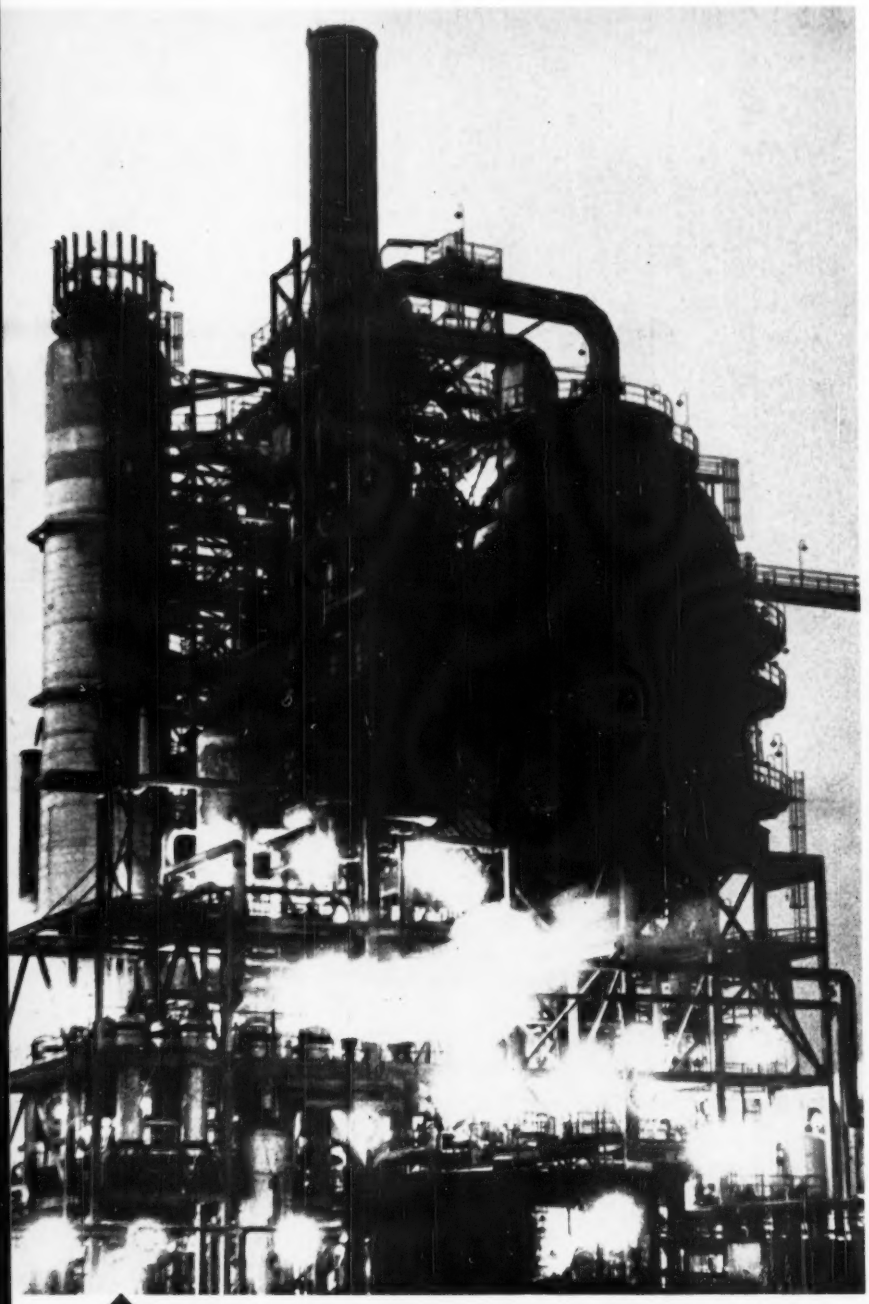
JULY 30, 1960

Chemical Week

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Refineries' changing catalyst diet . .

First-half sales soar to record high—but profit pattern is mixed . . . . . p. 20

Fuel cell race quickens tempo as foreign entries crowd field . . . . p. 28

X-rays probe the process stream, speed multi-element analysis . . . . . p. 36

HCl off the leash: new tank car frees anhydrous acid for rail travel . . . p. 49

Arsenic sales swell, bolstered by growing demand for weedkillers . . p. 57

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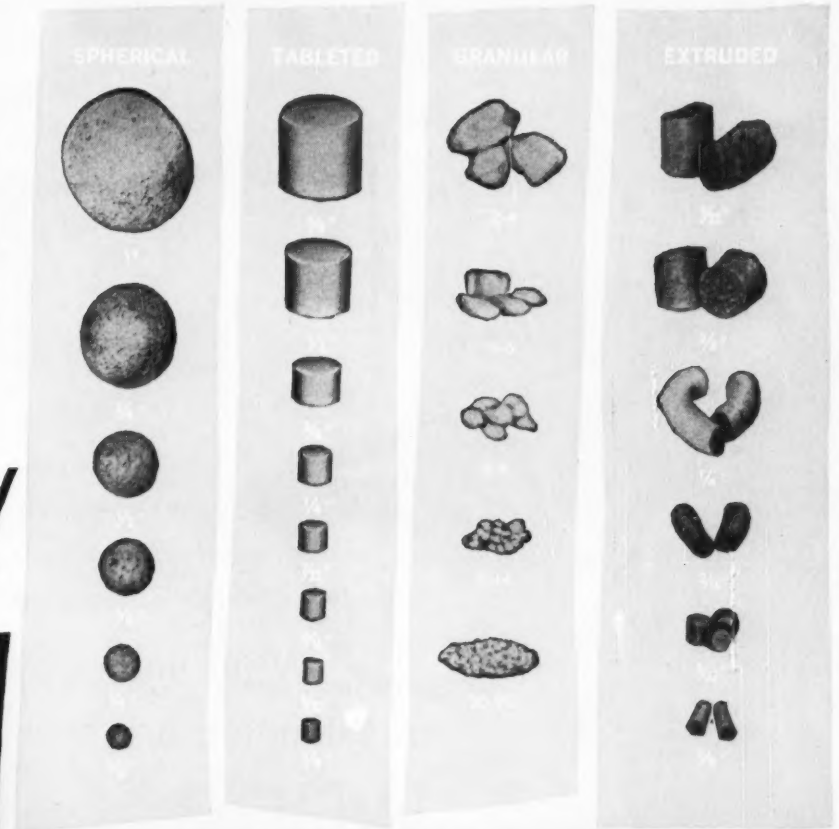
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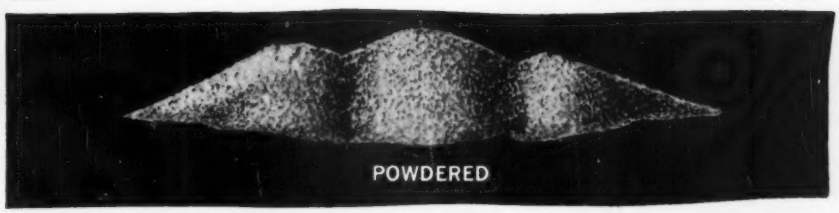
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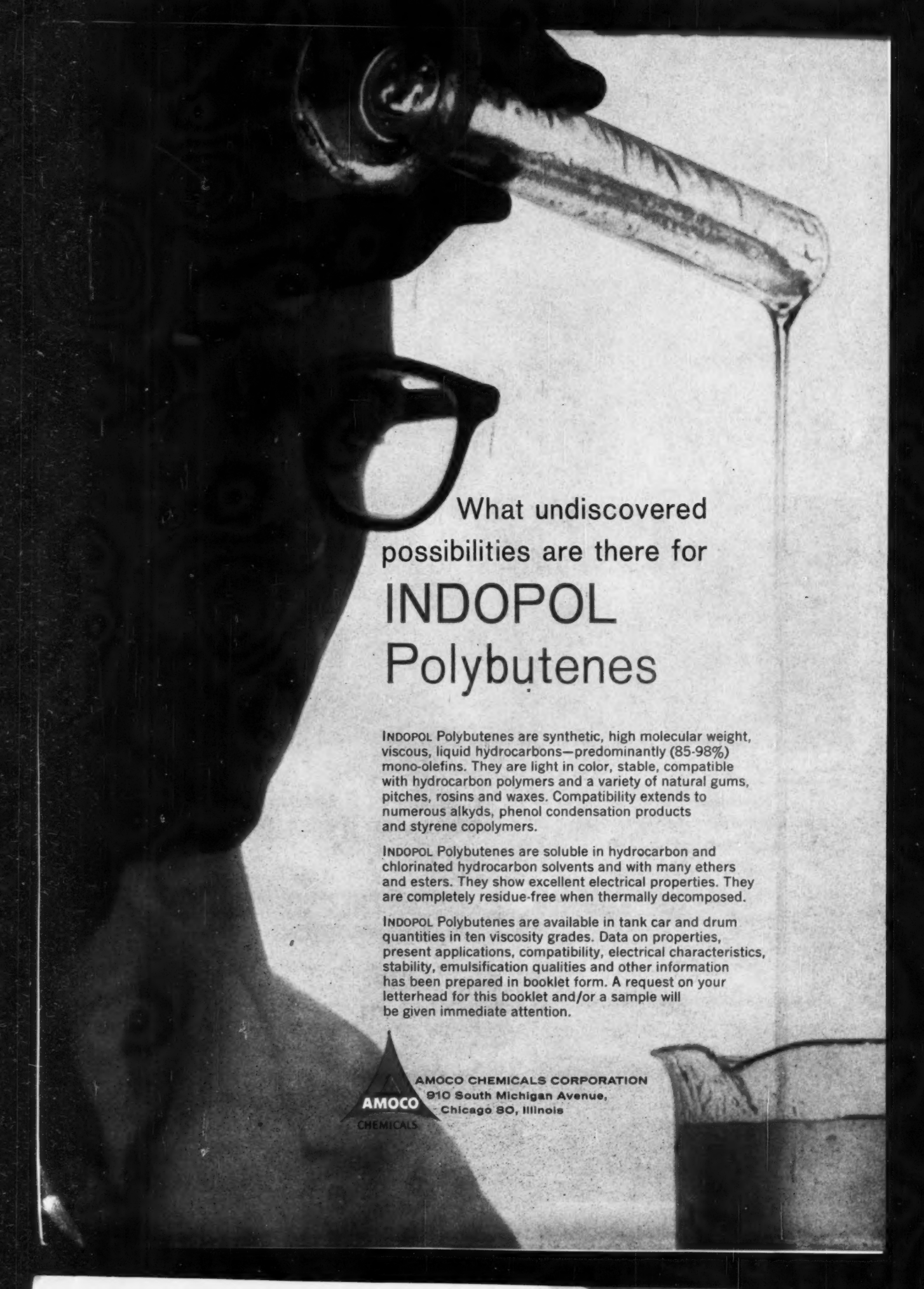


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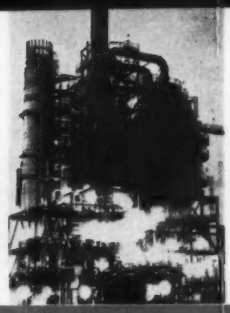
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ON THE COVER: The giant fluid catalytic cracker at Esso's Bayway, N. J., refinery recycles an estimated 60 tons/day of catalyst in meeting public's demand for new petroleum products. New catalysts augur more profitable refining operation.

Chemical Week

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A Shelter Against Storms

NO MATTER WHO WINS the coming elections, the process industries can expect some heavy weather. Industry leaders must cope as they can with the day-to-day storms, but they should fashion now a long-term preparedness program.

One particular action that may help the CPI comes to our attention. The American Assn. for the Advancement of Science last fortnight reported its belief that it and its scientist members should speak up more about scientific matters that affect the public interest. It suggested that scientists should do more to tell the public—and its elected representatives—about what they are doing and what effect their achievements may have on human welfare.

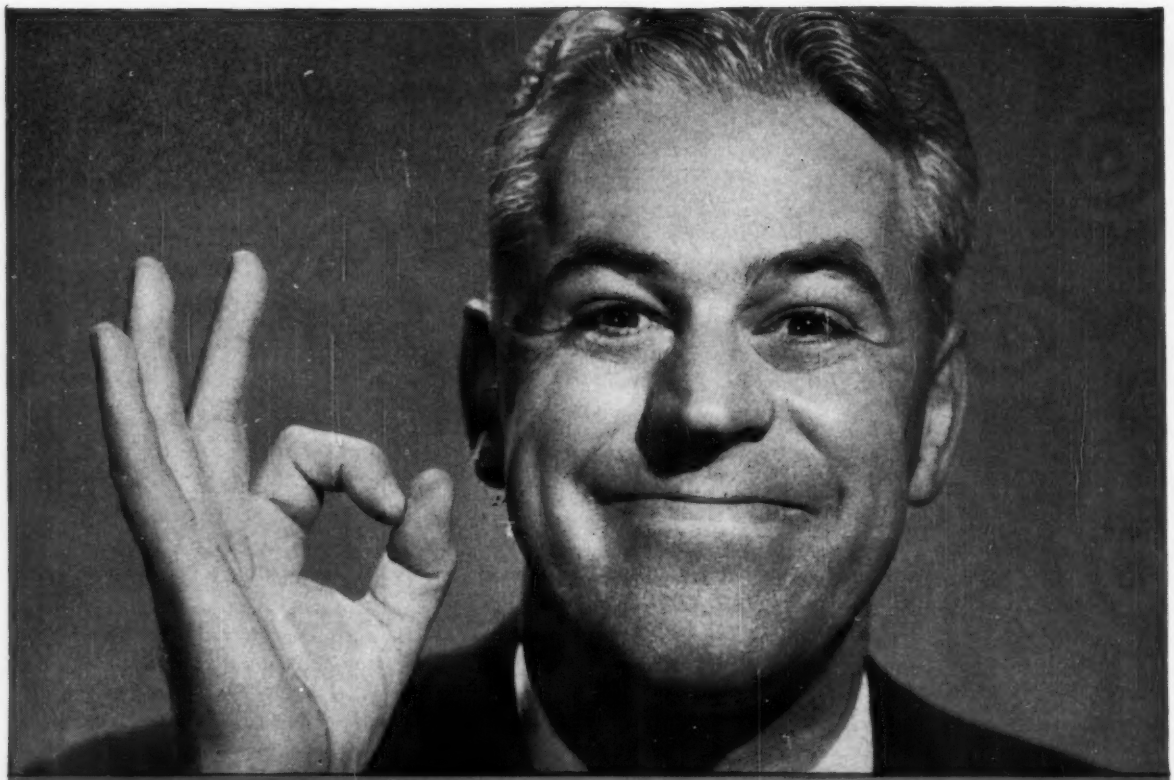
AAAS mapped what appears to be a highly constructive—and objective—course: "1) stimulation of discussion within the scientific community of issues relating science and human welfare in order to identify issues of immediate interest that need further amplification; 2) assembly of the facts—without recommendations—relevant to a given issue to inform scientists and to alert them to the expected consequences of alternative courses of action; 3) preparation and dissemination of similar reports, more popularly phrased for public consumption; and 4) development of liaison between scientists and the public on a local basis for the purpose of informing the public on issues affected by science and to fill the growing public demand for more scientific information."

The process industries—operating as they do in both the rarefied air of science and the denser atmosphere of legislation, control, and prosecution—can take some leaves from the AAAS logbook.

First, we urge process companies to urge their scientists to take up the AAAS proposals and act on them. Second, we suggest that companies, too, begin "stimulation of discussion. . . . of issues relating science and technology and human welfare" and take steps to alert the public "to the expected consequences of alternative courses of action" that process management may take.

Third, we suggest that process firms can do far more to inform the public of their activities. Like AAAS, we believe that had public attention been called to these activities 25 years ago, there would today be far fewer problems with air and water pollution, carcinogenic properties of chemicals, prices of drugs, and the like. We think that the attitude of the AAAS applied by process firms today may 25 years hence pay off with public understanding and ready acceptance of such necessities as automation of operations, increasing re-use of public water supplies, and earlier retirement of employees.

It seems to us, too, that these steps, initiated in and by the process industries, can do much to help avoid growing storms of demand—based largely on misinformation—for more and more government intervention in process industries' affairs.



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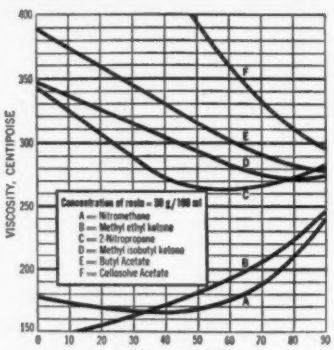
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LETTERS

Synthanite®

TO THE EDITOR: In a recent interview with Dorr Consultants (*June 25, p. 85*) mention was made of a building material called Synthanite. We would like to put on record that this is the tradename of the American Synthanite Corp. for its brand of synthetic anhydrite, on which application for registration has been filed.

WILLIAM E. RUDOLPH
American Synthanite Corp.
New York

Ammonia Processes

TO THE EDITOR: In your issue of June 18 it was interesting to read a letter by Mr. Pierre Guillaumeron of Air Liquide (one of the pioneers in the field of ammonia synthesis). Mr. Guillaumeron points out that the total capacity of plants in the U.S.A. using the so-called high-pressure ammonia synthesis process, developed by Georges Claude and Grande Paroisse, is 500,000 tons/year, which is about 10% of the total installed capacity of all ammonia plants in this country.

It is noteworthy to add that the tendency toward the middle-pressure system (about 5,000 psig.) has been particularly emphasized in the past few years. Ammonia producers who had their first ammonia plants installed on the basis of high-pressure synthesis (10,000 to 15,000 psig.) have switched for their additional manufacturing facilities to a much lower pressure.

Grace Chemical in Tennessee and Trinidad, CFCA in Kansas and Coastal Chemical Co. (associates of Mississippi Chemical Co.) are the most recent companies to show this new trend. In Europe the most interesting example is Societe Belge de l'Azote (SBA) in Belgium, a company that was one of the first to use the Claude process (since 1923-24). This company has lately developed its own medium-pressure process (300 atm.) and has adopted it for its own plant near Brussels as well as for its engineering projects in foreign countries.

Most of the important ammonia producers in the U.S.—Allied Chemical, Monsanto Chemical, Phillips Chemical, etc.—as well as those abroad—ICI, BASF, Kuhlmann, Montecatini, Sumitomo Chemical, etc.—are all using medium-pressure synthesis.

Concerning gas purity, in all plants using natural gas reforming, Chemico has been using its well-known medium-pressure synthesis process with a synthesis gas purified by such processes as copper solution scrubbing or methanation. These processes do not permit obtaining gas as pure as is obtainable by nitrogen wash. Therefore, it is questionable whether Mr. Guillaumeron's statement about the necessity of boosting the pressure for less-pure gases has been proved by the experience of all those plants using medium-pressure synthesis processes.

S. STRELZOFF
Assistant to the President
Chemical Construction Corp.
New York

Whiffen Address

TO THE EDITOR: We should like to point out that the address given (*June 18, p. 148*) under the heading "The 863 Major Chemical Producers in Europe" is incorrect. . . .

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MEETINGS

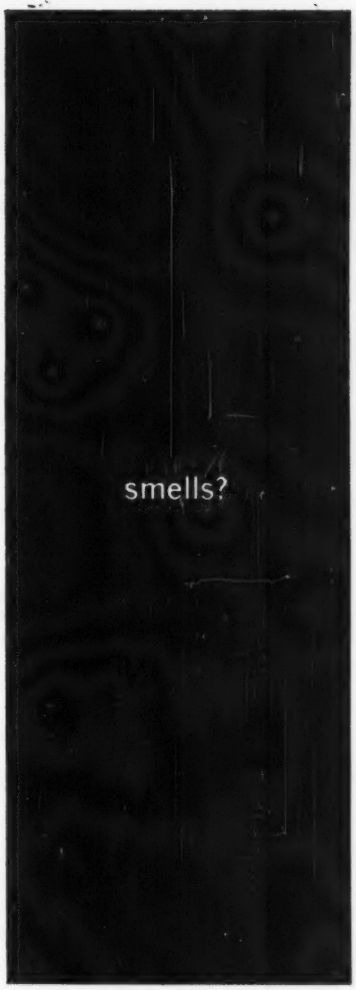
Gordon Research Conferences at New Hampton School, New Hampton, N.H.—Aug. 1-5, steroids and other natural products; Aug. 8-12, organic coatings; Aug. 15-19, analytical chemistry; Aug. 22-26, inorganic chemistry; Aug. 29-Sept. 2, adhesion.

Gordon Research Conferences at Kimball Union Academy, Meriden, N.H.—Aug. 1-5, solid-state studies in ceramics; Aug. 8-12, chemistry and physics of solids: point defects; Aug. 15-19, toxicology and safety evaluations; Aug. 22-26, infrared spectroscopy; Aug. 29-Sept. 2, high-temperature chemistry: kinetics of vaporization and condensation processes.

Columbia University Industrial Research Conference, Arden House, Harriman, N.Y., Aug. 7-13.

Heat Transfer Conference and Exhibit, Statler-Hilton Hotel, Buffalo, N.Y., Aug. 15-17.

Technical Assn. of the Pulp and Paper Industry, alkaline pulping conference, Multnomah Hotel, Portland, Ore., Aug. 22-24.



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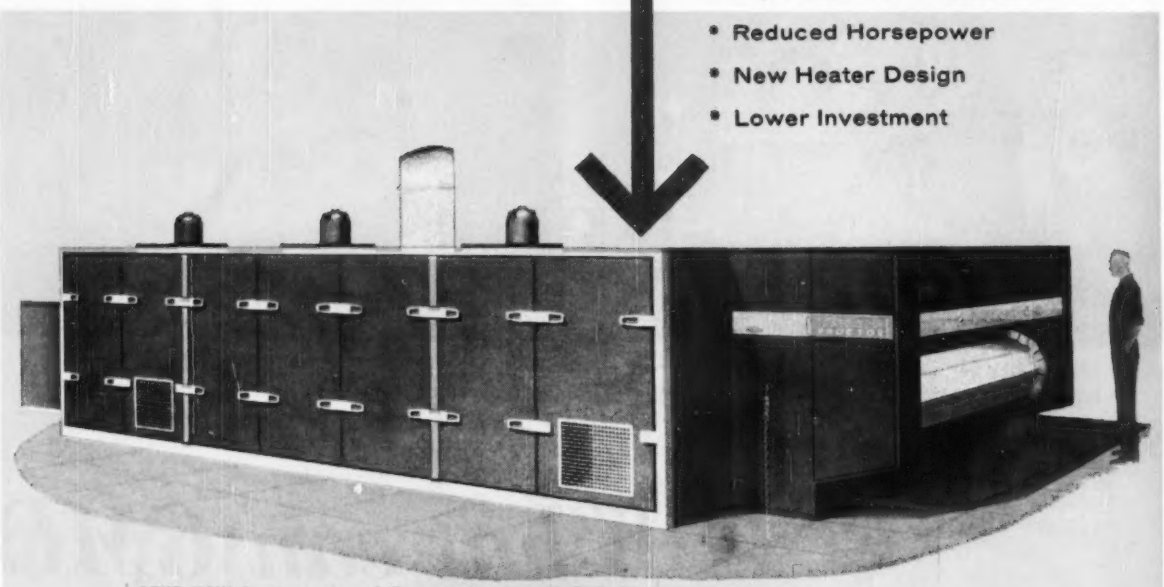
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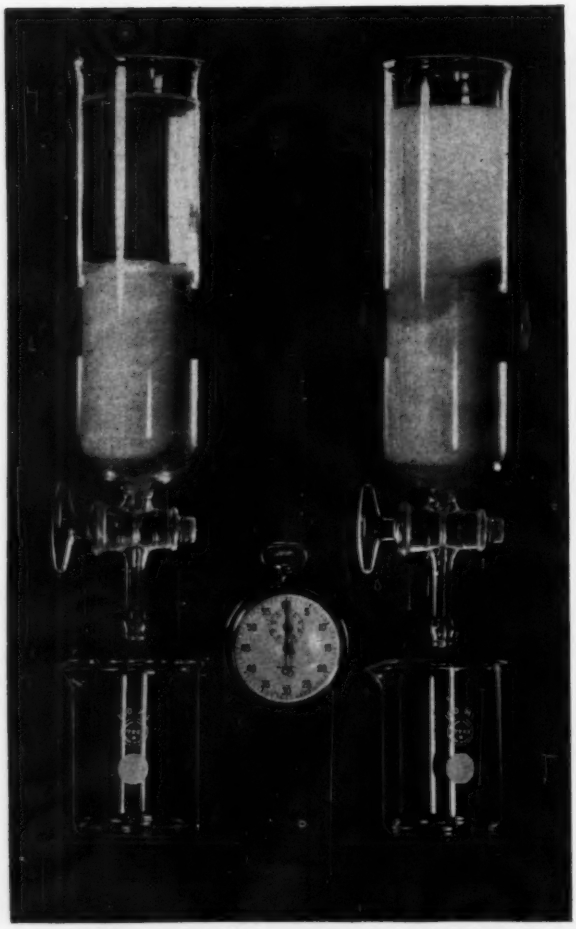
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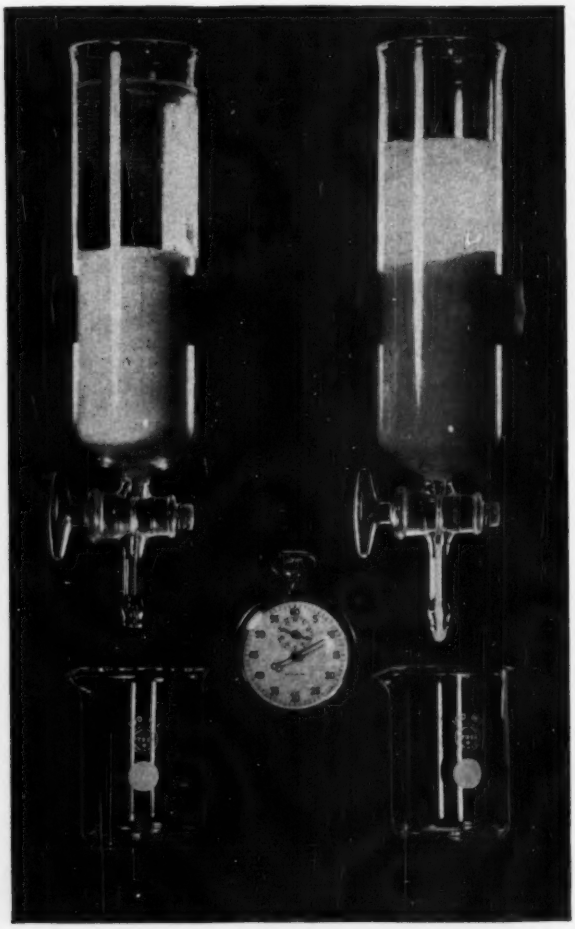
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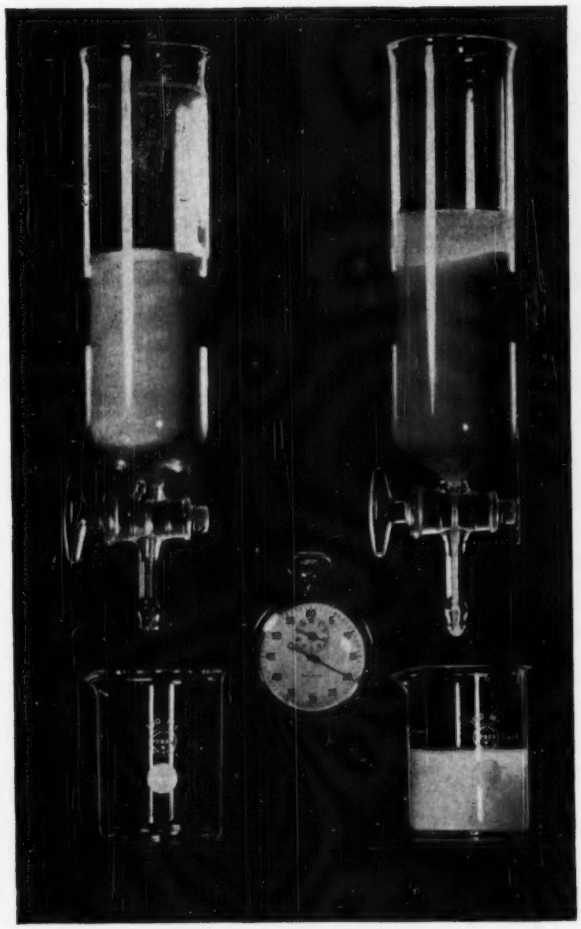
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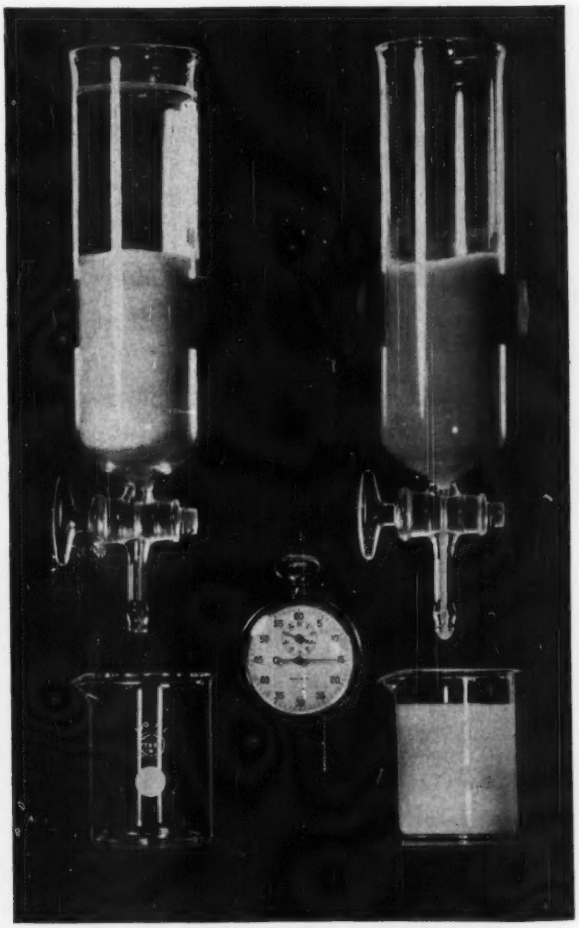
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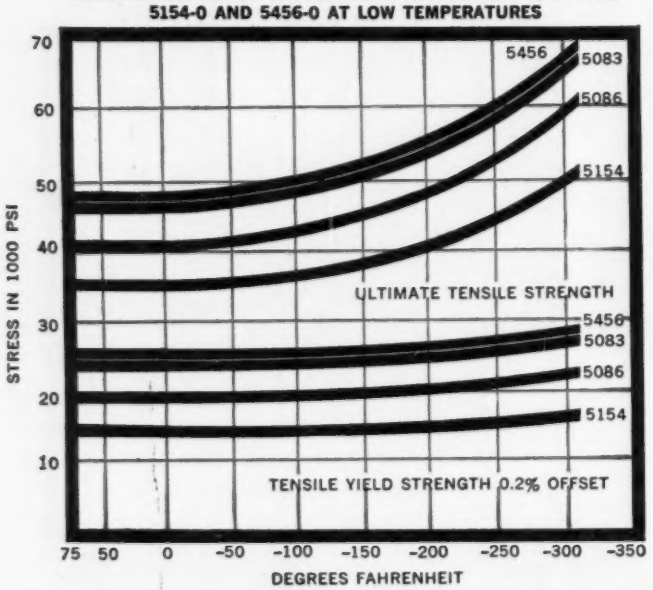
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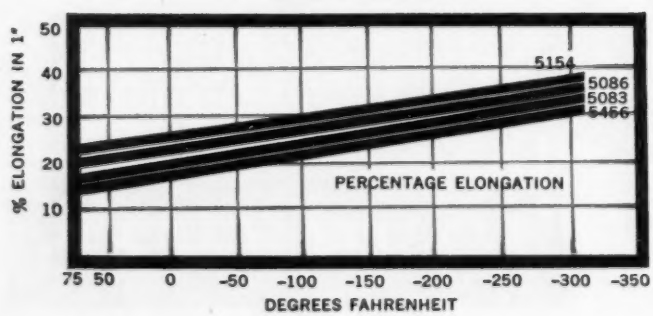
HERCULES

Why Aluminum for Low Temperature Equipment?

- **when temperatures go down, aluminum's strength goes up**
- **aluminum is light in weight**
- **aluminum is easy to fabricate**

TENSILE PROPERTIES OF ALUMINUM ALLOYS 5083-0, 5086-0, 5154-0 AND 5456-0 AT LOW TEMPERATURES





In the strange world of minus 250°F and below, materials often take on new and different properties—a fact which demands special design consideration for low temperature equipment.

And more and more frequently, designers are finding that aluminum, better than any other material, meets the mechanical, thermal and economic requirements for these "cryogenic" jobs.

For example, low carbon steels lose so much impact strength at low temperatures that they can't usually be considered. Nickel-alloy steels have better strength than low carbon steels, but in many cases are more expensive to fabricate than aluminum. Aluminum is one of the lowest-cost metals that retains or improves its impact strength at low temperatures.

LOW TEMPERATURE STRENGTH

Aluminum's properties change at sub-sub-zero temperatures, just as all metals do, but the change is for the better. The yield strength, tensile strength and percentage elongation of aluminum all *improve* as temperatures approach absolute zero. This is not true of all metals: Ferritic steels become brittle at low temperatures; the mechanical properties of stainless steel are improved, but it is costly when compared to aluminum.

INCREASING ALUMINUM USES

Largely because of its excellent low-temperature properties and its low cost, Reynolds Aluminum is used in containers, handling and processing equipment for liquefied gases.

Strong lightweight aluminum sheet, plate, pipe, tubing and extrusions are used to handle and process liquefied natural gases, oxygen, nitrogen, hydrogen, helium, and rare gases. Temperatures required to keep these in a liquid state range as low as −452°F, only 8° above absolute zero! Aluminum is the most economical material that can stand up under these extreme conditions.

In addition to its low temperature strength and ductility, aluminum offers other advantages in containers and handling equipment. It is light in weight—*one-third* the weight of steel—a big benefit in shipping containers and portable equipment.

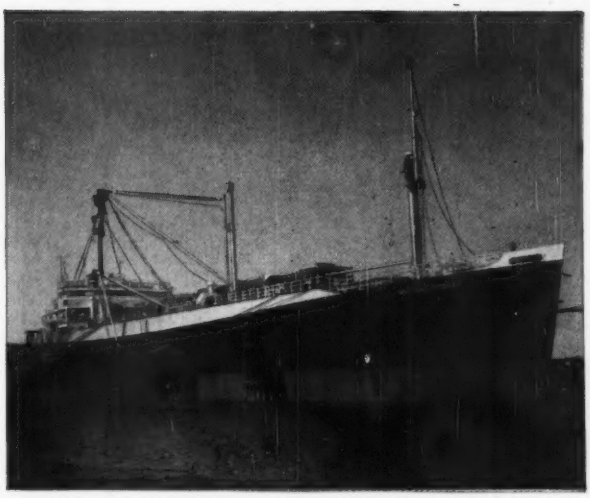
FABRICATION SAVINGS

Aluminum is easy to handle, easy to join and form. It welds and cuts quickly, often reducing fabricating costs. And it is non-magnetic, non-toxic, and non-sparking, safer to use with volatiles. Finally, *aluminum is one of the lowest-cost corrosion resistant materials available.*

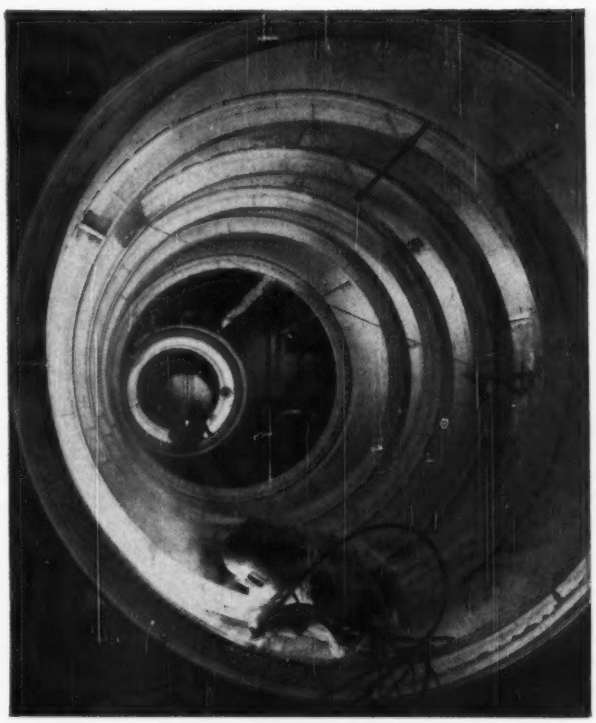
When you design any equipment for low temperature use, be sure to consider the economics and the low temperature strength of aluminum. For full information on aluminum for low-temperature duty, contact your local Reynolds office, or write *Reynolds Metals Company, P.O. Box 2346-CM, Richmond 18, Virginia.*

REYNOLDS ALUMINUM

Watch Reynolds TV Shows: "Bourbon Street Beat" and "Adventures in Paradise"; and, resuming in October, "All Star Golf"—ABC-TV

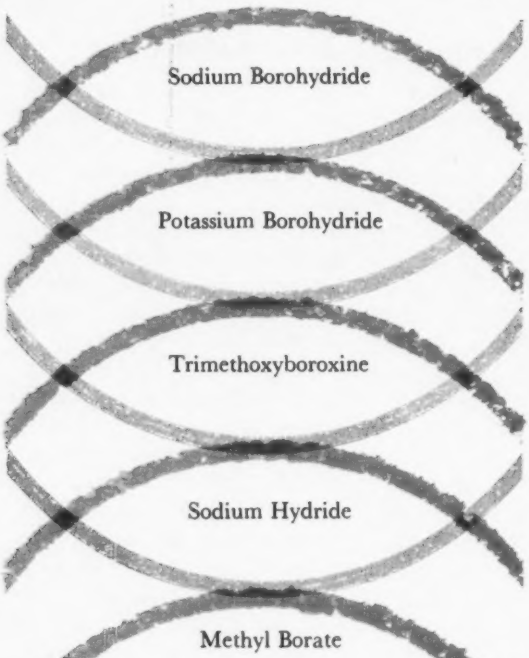


Ship designed to carry liquefied methane (at −260°F) to England. Liquid is kept in 6,000-barrel tanks made with Reynolds Aluminum plate, the one economical material with improved strength at low temperatures. Aluminum is also used in piping and processing equipment.



Aluminum welds quickly and easily by all common welding methods—as in this liquid gas tank fabrication. It also cuts and forms easily, often effecting savings in construction. And it is one of the most economical corrosion-resistant materials.

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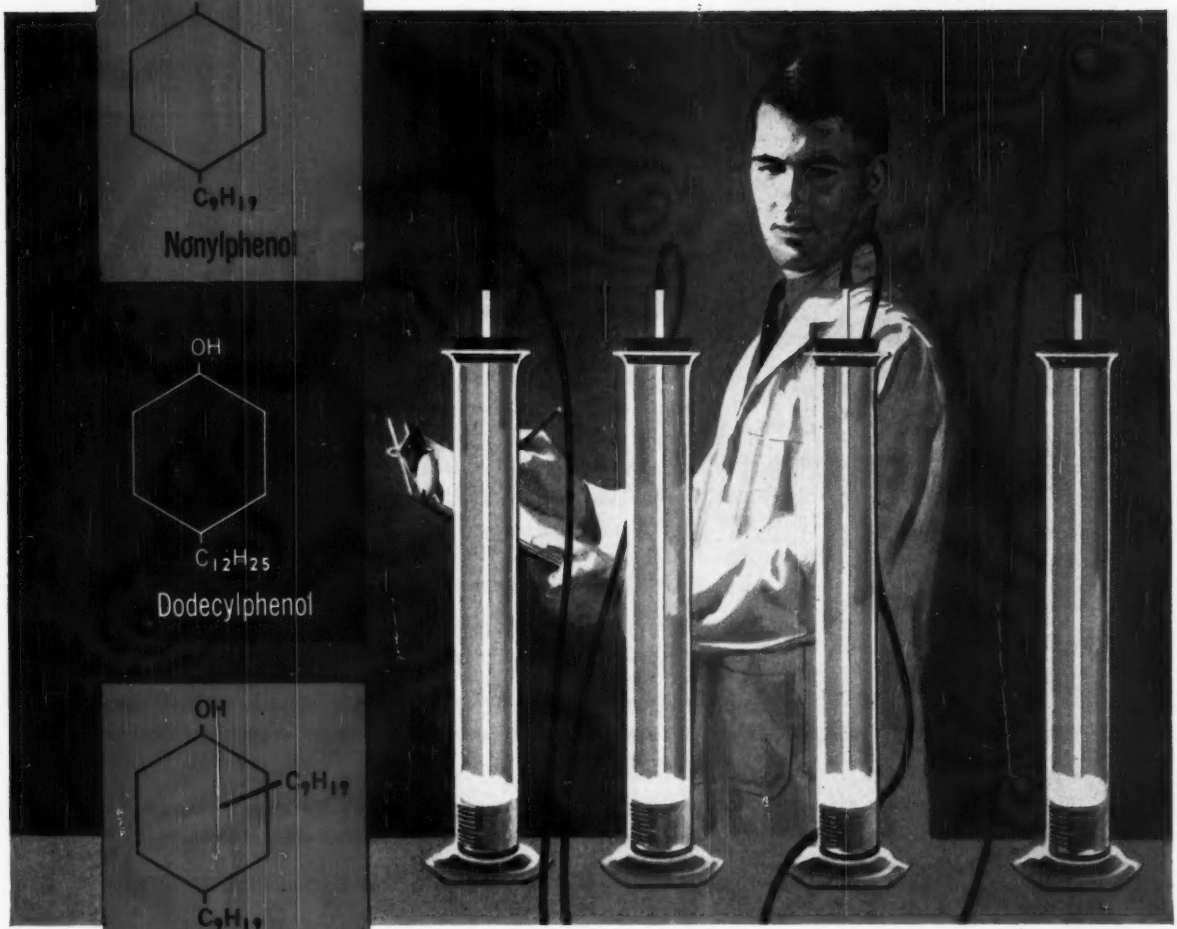
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Business
Newsletter

CHEMICAL WEEK
July 30, 1960

A major shift in use of man-made fibers is a potent factor in some chemical companies' sales and earnings data out this week (*see also p. 20*).

Largely because of nylon's gains—at the expense of rayon—in the tire-cord market, at least two major rayon producers have been taking a buffeting:

• Industrial Rayon is running in the red. It showed a net loss of $1.4 million in first-half '60, compared with a net income of $556,000 in the first six months of '59. Main reasons for the deficit: lowered volume of viscose fiber sales and startup expenses on facilities for increased production of textured nylon yarns and polypropylene fibers. Management says it's now unlikely IRC will realize earlier hopes for approaching a break-even point in this third quarter and for moving into the black in the fourth quarter.

• American Viscose suffered a more than 50% slash in first-half earnings—from $7.8 million in '59 to $3.7 million this year. Six-month sales slipped from $126.7 million to $108.2 million. These declines were blamed on decreased shipments of rayon yarns and staples, and lower prices received for those products. Although per-share earnings sank to 36¢ in the second quarter, Viscose is continuing its 50¢ quarterly dividend rate for the time being.

Though nylon seems to be winning out in tire cord, price cuts during the past year have crimped profits for principal producers such as Du Pont and Chemstrand, despite increases in physical sales volume.

Eastman Kodak—whose over-all sales and earnings are moderately higher than in first-half '59—reports "continued good growth" in sales of its acetate fiber for cigarette filters. Acetate yarn sales are about the same as they were a year ago, but sales of acrylic polyester fibers are up.

•

Still more emphasis on chemical ventures in the Southwest is indicated by Mobil Chemical's appointment of Eber H. Peters as manager of Southwest manufacturing. Ebers will be headquartered at Beaumont, Tex., where Mobil has a $25-million high-purity ethylene plant under construction—hub of what's expected to become a vast chemical complex. Already scheduled to draw from the Mobil feedstocks: Goodyear Tire & Rubber and Houston Chemical. Mobil Chemical recently was set up as a separate operating division of Socony Mobil Oil.

•

On the West Coast, Wilshire Oil is considering petrochemicals. Wilshire, recently acquired by Gulf, is said to be studying the benzene and naphthalene markets. Meanwhile, its 35,000-bbls./day refinery near Santa

Fe Springs, Calif., is being expanded. In May a 65,000-gal./day alkylation unit went onstream, and installation of a blender is set for fall.

•

One of the nation's largest fertilizer facilities is ticketed for the Midwest. California Spray-Chemical has just planned construction of a $22-million nitrogen fertilizer complex at Fort Madison, Ia., to produce 600 tons/day of complex fertilizers, 150 tons/day of prilled ammonium nitrate, 300 tons/day of anhydrous ammonia. The new Calspray operation, on the Mississippi River, has access to rail and truck transportation.

•

And in Gary, Ind., Kaiser Aluminum & Chemical Corp. is building a $1-million plant for calcining petroleum coke. (The coke will be used to manufacture carbon electrodes for the reduction cells in the company's primary aluminum plants.) A 180-ft. rotary kiln is to be installed, with calcining capacity of 120,000 tons/year. Startup is slated for fall.

•

Chemical projects in Latin America continue to sprout, despite the threat to stability posed by the turmoil in Cuba—where the shape of things to come was marked by last week's seizure of Armour's fertilizer mixing plant near Havana.

In Colombia, which is nearing its own political crisis, B. F. Goodrich Chemical plans to build the country's first polyvinyl chloride plant. Almost all of the raw material will come from local sources, and all of the plant's output will be used in Colombia—for industrial uses such as pipework and ducting.

In Argentina—where an antigovernment plot between Cuban officials and Peronists is reported brewing—Royal Dutch/Shell plans to invest some $56 million for general developments, which may include petrochemical projects. Also in Argentina, Imperial Chemical Industries will build a $16-million polyethylene plant.

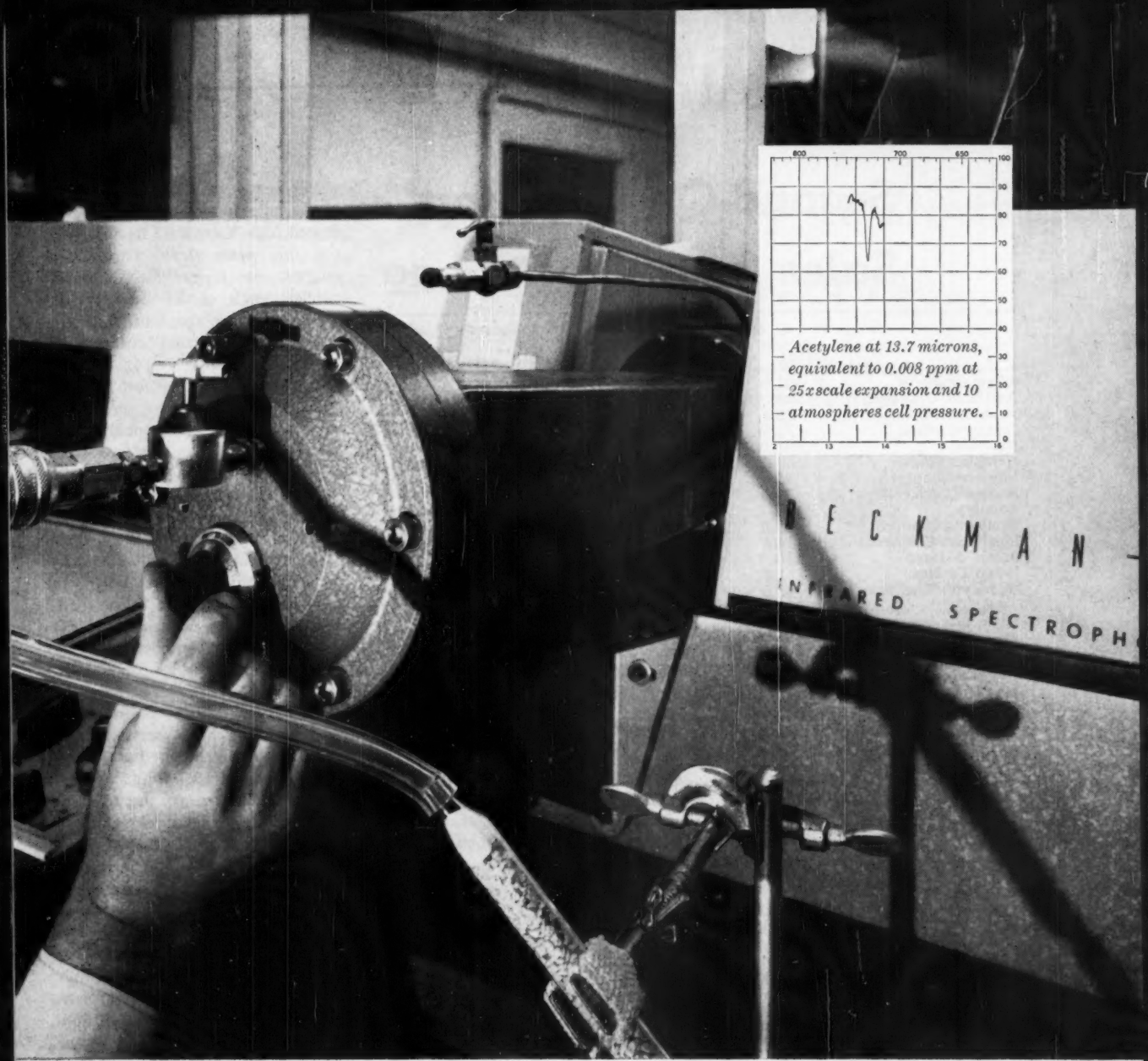
And in Mexico, still considered one of the most stable Latin-American countries, despite the recent pro-Cuban, anti-U.S. demonstrations more U.S.-backed projects are coming up (*see p. 22*).

•

Chemical labor unions have their share of headaches this week:

At Torrance, Calif., the AFL-CIO's Metal Trades Council—which for nearly two years has represented the maintenance employees at the Union Carbide Chemicals plant there—lost all representation rights at that plant when it tried to take over all hourly paid employees.

And there were new work stoppages, North and South. About 350 members of UMW's District 50 are striking for pay rises and fringe benefits at Allied Chemical's Semet-Solway plant at Tonawanda, N.Y. More than 1,700 members of International Chemical Workers Union (AFL-CIO) staged unauthorized strikes at five phosphate plants in Florida.



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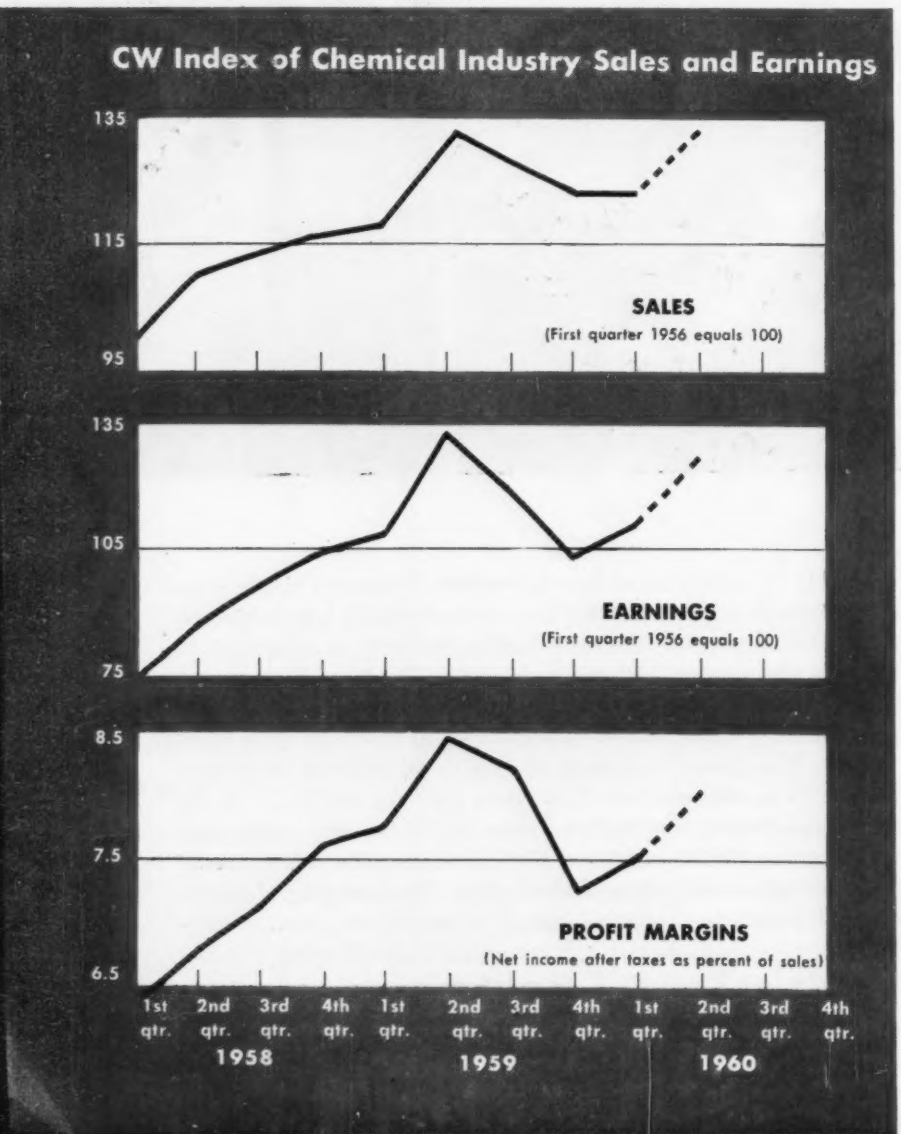
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INSTRUMENTAL IN YOUR FUTURE 25 YEARS 1935-1960

Second-Quarter Story—Sales Soar; Profits Lag

	SALES 1st half 1960*	SALES Change from 1st half '59	EARNINGS 1st half 1960*	EARNINGS Change from 1st half '59
Allied Chemical	$ 401.0	Up 7.7%	$ 30.9	Up 10.6%
American Cyanamid	305.2	Up 2.6%	28.4	Up 4.6%
American Potash	26.4	Down 1.1%	2.6	Up 3.2%
Diamond Alkali	71.5	Up 7.9%	6.4	Up 22.5%
Du Pont	1,097.0(1)	Up 2.7%	140.0(2)	Down 8.0%
Hercules Powder	160.5	Up 17.0%	12.9(3)	Up 10.3%
Heyden Newport	30.6	Up 9.8%	1.8	Up 30.6%
Hooker Chemical(4)	75.0	Up 0.4%	6.4	Down 7.4%
Koppers	147.7	Up 29.1%	4.2	Up 47.4%
Monsanto Chemical (5)	431.8	Up 4.4%	33.5	Down 4.9%
Reichhold Chemicals	49.8	Up 5.0%	1.4(6)	Up 17.5%
Rohm & Haas	116.2	Up 6.2%	12.3	Up 3.8%
Union Carbide	771.6	Up 1.5%	81.2	Down 10.2%
Wyandotte Chemicals	46.6	Up 7.1%	2.0	Up 1.4%

* Dollar figures in millions. (1) Preliminary. (2) Net operating income, estimated by CW. (3) Estimated by CW. (4) For six months ended May 31. (5) Parent company, subsidiaries, and proportionate shares for associated companies. (6) Excluding capital gains on sale of securities.



For nearly all U.S. chemical companies, sales volume is at an unprecedented high. Corporate financial data out this week show that second-quarter sales topped the abnormally swollen totals of the corresponding period one year ago, when industrial buying was accelerated because of the expected steel strike.

But a jarring note for many of these companies is that profits are out of tune. Larger companies' managements are particularly concerned, are already cracking the whip on efficiency drives expected to result in improved earnings ratios during the rest of this year.

Parodoxically, some companies whose profits were lagging behind the industry trend last year have scored impressive increases in earnings during the past six months; last year's leaders meanwhile were sustaining setbacks. Notable example: Koppers Co., which cleared only 2.5% on sales in last year's first half, scored about a 50% rise in earnings for the first six months of 1960. And Heyden Newport went against the trend by lifting second-quarter earnings by 30% on a sales increase of 10%.

Earnings Erosion: With prices virtually "frozen" despite higher operating costs and increasing depreciation charges, most of the larger companies surpassed their sales peaks of spring '59 but found their profits falling short. Biggest single bite out of earnings is noted in the case of Du Pont. On the basis of net operating income, estimated by CHEMICAL WEEK at $74-75 million, Du Pont's second-quarter return on sales was about 13.3%, compared with the 14.6% mark recorded in last year's second quarter.

Similarly, Union Carbide's second-quarter profit margin fell from 12.3% in '59 to 10.4%. For American Cyanamid, the drop was from 9.3% to 8.2%. For Monsanto—now reporting on a worldwide consolidated basis—the earnings ratio dipped from 8.6% to 7.9%. Allied Chemical nearly held its own, its second-quarter margin slipping only from 8.1% to 8.0%. For Rohm & Haas, the fall was from 11.4% to 10.6%. Hooker's decline was from 9.3% to 8.8%. Hercules' second-quarter margin was down from 9.3% to 8.4%.

Countering the trend, Reichhold's second-quarter earnings ratio was unchanged at 2.9%; and two chemical producers are reporting increases: American Potash, from 9.5% to 10.2%, and Diamond Alkali, from 7.8% to 8.9%.

Because these companies' expansion programs give rise to steadily higher charges for taxes, amortization and other overhead items, the efficiency drives now under way will have to go hand-in-hand with continuing strong sales volume during the second half of the year if earnings ratios are to make noticeable progress. Most management men are optimistic on this score.

Drug Upswing: Pharmaceutical companies this week also are reporting their highest sales totals on record. Earnings for the first half of 1960 also are up—although there are some exceptions.

One example: Upjohn Co., which lifted first-half sales by 5.8%, to $76.5 million, and earnings by 7.1%, to $10.5 million. Second-quarter profits, however, dipped by 2.6%, to $4.6 million, despite a 3.8% rise in sales to $36.8 million.

Even more striking is the case of Smith Kline & French. Its first-six-months sales mounted by 9.2%, to $72.9 million; but net earnings dropped by 5.7%, to $12.1 million. Two reasons for the profit decrease were cited: this year's operating costs are higher; and last year's net income was augmented by nonrecurring overseas tax benefits.

For the entire first half, G. D. Searle boosted sales by 6%, to $18.3 million, and earnings by 5.1%, to $3.9 million. But despite a slight increase in April-through-June sales, second-quarter profits dipped by 1.5%, to $1.96 million.

Other pharmaceutical firms:

U.S. Vitamin & Pharmaceutical, which showed modest increases for the first six months, with sales up to $7.2 million and income up to $962,979. Political conditions in some foreign markets hurt exports, but this effect was more than compensated by improved sales in the U.S.

Parke, Davis & Co., which boosted world-wide sales by 9.1% to more than $99 million. First-half earnings climbed by 10.1% to $15.1 million.

Styrene Capacity—It Grows and Grows and Grows

Shell Chemical on West Coast, and Sunray Midcontinent on Gulf Coast are adding capacity even as prices edge down

Styrene's growth rate is hitting a new high this week. Two companies are adding 130 million lbs./year to U.S. capacity—already projected to hit 2.1 billion lbs. by late 1962. Result: a nearly 50% jump over last year's levels.

Major producers hold that there's nothing but success ahead for their expansion projects. They're banking on burgeoning plastics markets (ranging from latexes to molding powders) and a steadily growing styrene-butadiene rubber market to keep up with swelling styrene production.

Latest to report plans: General Manager John Cunningham of Shell Chemical's Synthetic Rubber Division. As expected (*CW Business Newsletter, Dec. 12, '59*), Shell has awarded to Erhart Associates a contract for boosting capacity of its estimated 135-million lbs./year plant at Torrance, Calif., to 210 million lbs.

And just last week, Sunray Midcontinent Oil said it would enter the styrene field by building a 60-million lbs./year unit at its Suntide refinery, Corpus Christi, Tex. (*CW Business Newsletter, July 23*). It speculated that Suntide might well go one step further and start turning out polystyrene, but company officials say only that all planned output is contracted for on a long-term basis. They add that the plant may readily be expanded to 75 million lbs./year.

Meanwhile, Monsanto—which last February revealed its own plans to add two new 100 million lbs./year monomer units somewhere along the Gulf Coast—has one of the planned units already under construction at Texas City. It is still undecided on a site for the second. By 1962, Monsanto will have total capacity of 600 million lbs./year.

And Dow is expanding at Freeport, Tex., and Midland, Mich., to boost its over-all capacity to 800 million lbs./year.

Such moves have sparked talk of serious over-capacity—perhaps exceeding 500 million lbs./year—by late '62.

But producers see these reasons for optimism:

(1) This year, polystyrene is expected to become another billion pounds/year plastic—like vinyl and polyethylene, both of which passed the mark in '59.

(2) New styrene polymers and copolymers—with better heat and chemical resistance, ultraviolet stability and other improvements—will open new volume markets.

(3) Whopping growth in the styrene-based latex market, as better industrial finishes with fire-retardant properties are introduced.

(4) Mounting use of both reinforced styrene resins and increased consumption of reinforced polyesters (in which substantial quantities of styrene are used).

(5) Polystyrene foam now has a foothold in applications ranging from insulation to novelties, is expected to be consumed in millions of pounds/year in the near future.

Success Story: Koppers is one of the firms that foresee big gains for styrene-based foams in the next few years. Looking ahead, Koppers, with Sinclair Oil, set up subsidiary Sinclair-Koppers to build and operate a 70-million lbs./year styrene monomer plant near Houston, Tex. It already produces about 200 million lbs./year of styrene. Koppers plans to use nearly all its output captively, foresees volume sales for all its polystyrene products. Case in point: Dylite expandable resin, aimed at insulation and other building applications.

Two of the most coveted fields for volume use of polystyrene: construc-



CREDIT: SHELL CHEMICAL CORP.

Shell's Cunningham: He'll boost styrene output on West Coast.

tion, and home and office furnishings.

Styrene's price trend has been down in the past several years—reflecting an attempt to discourage rubber producers from making their own styrene. Now it's expected that the price will hold steady after the July 1961 drop initiated by Monsanto. (New base price next July will dip to 11.2¢ from the present 12¢/lb.)

One reason for the predicted stabilization: development of the Hydeal (Universal Oil Products) process for naphthalene-benzene. Use of this route —as in the unit dedicated last week by Ashland Oil at Catlettsburg, Ky.— will tend to tie the price of benzene to toluene or xylene, and thus stabilize the styrene price at a low level.

Although there has been industry comment that no company would find it profitable to sell styrene abroad, Monsanto Chemical says its product is selling in Europe at the domestic price.

If markets pan out as companies anticipate, the only foreseeable hazard would be entrance of big oil companies like Gulf and Humble into the styrene market. A decision to upgrade their refinery byproducts to styrene—as Suntide and Ashland will do—could add another whopping 600 million lbs. or more to the swelling styrene capacity. But present producers feel that since these oil companies have delayed this long, they will be in no hurry to make such a move in the near future.

Moving in Mexico

More jostling between U.S. companies for chemical markets in Mexico will be triggered by latest expansion plans of Allied Chemical Corp.

Allied, which has lagged behind the other major producers in foreign investments, seems to have picked Mexico for its first major non-U.S. ventures. The stepping stone for what could become a large worldwide expansion program is Allied's licensing agreement with Celulosa y Derivados, an affiliate of Grupo Quimico de Monterrey. Allied will provide the technology and its Genetron brand name for products from Celulosa's hydrofluoric acid, carbon tetrachloride, and fluorinated hydrocarbons plants, which will be built in Monterrey.

In itself, the arrangement is a straight licensing deal. But it will give Allied an outlet for output of its Mexican fluorspar mine which is now being developed. Allied has held an option on the reserves for many years.

Chain Reaction: And Allied's connection with the Monterrey group will probably lead to other projects. Under license from the Dutch company, Enka, Celulosa will produce nylon 6 (as well as 66), and is expected to get the caprolactam for its nylon 6 from Allied. This, however, could be blocked by plans of the Mexican petroleum agency, Pemex, which is reportedly considering producing caprolactam itself, and could cut off competing imports or domestic production.

Soda Ash Possibility: The Monterrey group also has big glass interests. Allied, and several other U.S. companies, have long considered building a soda ash plant, using raw materials in the Monterrey area. Now Allied is reported on the verge of signing a deal for a "giant" soda ash plant with the Monterrey group. It would reportedly be in the $15-million range, would include licensing and possibly some financing by Allied.

Celulosa's venture into fluorinated hydrocarbons—which it says will be large enough to supply all of Mexico's present and future needs—gets right in the way of Du Pont. Du Pont has reportedly been supplying most of Mexico's fluorinated hydrocarbon needs from the U.S., while talking about building a Mexican plant for two years.

According to local reports, a major reason for Du Pont's delay had been that it was unable to get firm commitments for raw material—hydrofluoric acid—from Stauffer's 50%-owned affiliate, Fluor-Mex. Fluor-Mex has been operating at capacity a small plant in Santa Clara to supply Pemex refinery operations. But it has been unable to expand because of a waste disposal problem. Now, Stauffer says, it will close down the Santa Clara plant; it has already started work on a large unit—150 tons/month—at San Luis Potosi. This is due onstream in December.

The Allied-Celulosa venture may now scotch Du Pont's plans. But Stauffer says it will go ahead with its new plant in any event, and expects to operate at full capacity.

Polish Export Push

With Poland aiming to boost chemical output by 250% during the next five years, Western producers can expect more competition from Polish chemicals on the world markets.

A Polish government export official made this clear in a recent statement to a CHEMICAL WEEK correspondent. He said Poland expects to boost chemical exports 20%, to $55 million.

Right now the big items on Poland's export list are soda ash (up 50% over last year to 200,000 tons/year), caustic soda (30,000 tons), carbide (25,000 tons), chrome alloys, phosphorus and nitrogen fertilizers, benzene, naphthalene and toluene. Considerable quantities of lampblack, acetic acid, styrene, trichloroethylene, zinc oxide and dyes and lacquers are also exported.

Drive in Drugs: Pharmaceuticals will be one of the big gainers.

Thus far, Poland has supplied large quantities of pharmaceutical raw materials and intermediates to Western Europe. Now finished pharmaceuticals will be added to the export list, notably antibiotics, serums, and patent medicines.

The Poles are out to win new customers. Last year, countries like India, Indonesia, Pakistan, Iran, the United Arab Republic and South Africa appeared for the first time on Polish drug export lists. And this year, Polish trade planners hope to send pharmaceuticals to 44 non-Communist countries.

Soviets Seek to Liquidate CPI Problems

The Central Committee of the Soviet Union's Communist party — Russia's "Board of Directors"—gathered last fortnight in a plenary session to review Russia's economic progress. Gist of the closed-door meeting: Things are going well over-all in the chemical and other industries, but there are shortcomings and an effort is being made to eliminate them.

The Central Committee's official report, for example, states that for the first six months of this year, industrial production rose 10%, while chemical and rubber output was up 11%.

Among the report's specific notes on gains for the first half of this year, compared with first-half '59: mineral fertilizer and sulfuric acid, up 7% to annual rates of 13.6 million tons and 5.4 million tons, respectively; synthetic fibers, up 13% to an annual rate of 200,000 tons; synthetic resin and plastics, up 11%. Output of polyethylene rose 66%; polystyrene and styrene copolymer, 23%; ethyl alcohol, 14%; urea resin, 56%. Unspecified gains were also claimed for synthetic rubber.

In the same period, capital investment rate in the chemical industry increased by 41%, and value of production of chemical equipment rose to 54%, to more than 1 billion rubles ($250 million at the official exchange rate, $100 million at the tourist rate).

The Central Committee heard an optimistic report from A. N. Nesmeyanov, president of the Soviet Academy of Sciences. Polymer research, he told the members, has been stepped up substantially in the past two years, and a number of new substances developed. Among the "novelties" are silicones, described by the Russians as "new silicon-organic polymers, remarkable for their high heat resistance, elasticity, and improved dielectric characteristics."

Work on stereospecific polymerization, Nesmeyanov announced, had led to new types of synthetic rubber, plastics, and fibers. Plans for an experimental unit to produce "Enanth," a new synthetic fiber "superior to Kapron" polyamide fiber are complete. And new kinds of polyether acrylates—used for impregnating and drying electrical windings—will be of major economic importance, he predicted.

Pitfalls to Progress: Despite these strides, the meeting report makes it clear that a number of problems will have to be overcome if over-all targets are to be reached ahead of the seven-year plan schedule which is part of a broad 20-year plan—guided by top planner Alexei Kosygin—to overtake the U.S.

Rubbing off the Bloom: Nesmeyanov himself had some criticisms. "It should be noted," he warned, ". . . that much research in the field of polymers smacks of purely empirical searching. It is necessary to concentrate more effort on . . . fundamental research in this promising field."

And there are more general industrial problems to be overcome, many of which directly involve the chemical industry.

Capital construction is lagging, has reached only 87% of its planned level. To meet the goals, the present effort in designing and surveying must be more than doubled, Nesmeyanov indicated.

Long Lag Time: Another general problem is that new technology—particularly technology involving mechanization and automation—is being put to use too slowly.

A good example of this kind of lag comes not from the Committee report, but from a recent statement by an engineer in the Scientific Research Economic Institute. Four plants are being built for producing synthetic ethyl alcohol from dry refinery gas, he asserted, despite the fact that production from liquefied gases is cheaper by as much as 30%. And although there is a process for making synthetic rubber directly from butane, eliminating the step of converting butane into ethyl alcohol, new capacity for ethyl alcohol is being planned anyway. Responsible planners want to hold off on the new synthetic rubber process until 1975.



CREDIT: V. MASTINKOV

Alexei Kosygin sets the Soviets' 20-year industrial production goals.

But the plenum report also struck out at poor production quality, a charge that applies to the chemical industry. Last March, for example, three top Soviet scientists complained that Soviet polyvinyl chloride was not transparent (as foreign material is), has low workability, heat, light, and shock resistance, and is "unsuitable for highly productive methods of manufacture."

New Price Policy? One very significant criticism was that wholesale machinery prices become outdated in many cases and don't correspond to production costs.

Such complaints have led to a call for a revision of industrial price structures in 1961 or '62, and the Soviet Economic Council was directed to submit proposals on methods of setting new prices. This may ultimately have an effect on Soviet trade—to the extent that economic considerations affect Soviet trading decisions.

And there are other complaints: too little cooperation among the different economic regions, too little standardization of components and processes, too few trained engineers, too much tolerance of conservative or inept industry managers.

Old Story: The most significant thing about these complaints is that they are virtually the same ones voiced at previous meetings. One obvious conclusion is that these problems may be rooted deep in the nature of the Soviet political system and social structure and will be hard to correct. But the Soviet leaders mean to try. Already a whole series of corrective measures are under way.

EXPANSION

Polypropylene, Phenol: Dow Canada is in engineering stages on facilities for propylene compounds and for polypropylene at its Sarnia, Ont., complex. Compounds included: propylene oxide, propylene glycol, and polyglycols. No dates for start-up have been set. Dow says its polypropylene process will be complementary to the one used at Sarnia to produce high-density polyethylene.

The Company's phenol plant at Tilbury Island, near Vancouver B.C., will be constructed by Canadian Bechtel, Ltd. Ground will be broken soon on the 123-acre site and production is planned by mid-1961.

•

Fluorinated Hydrocarbons: Allied Chemical's General Chemical Division will expand General's fluorinated hydrocarbons capacity by one-third with the construction of a new plant at Elizabeth, N.J., for its Genetron refrigerants and aerosol propellants. Initial products: dichlorofluoromethane, trichloromonofluoromethane, and monochlorodifluoromethane. Completion of facilities is scheduled for early 1961. The company also has Genetron products plants at Baton Rouge, La., and Danville, Ill.

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Chlorine, Caustic Soda: J. T. Donald and Co. (Montreal) will build the $2.6-million liquid chlorine and caustic soda plant for Consolidated Mining and Smelting Co. at Trail, B. C. The products will be used at the $50-million kraft pulp mill of Celgar Ltd., now under construction at Castlegar, B.C.

•

Benzene, Toluene: Texaco Canada will enter the petrochemical market with construction at Port Credit, Ont., of benzene and toluene facilities. Estimated costs: $2 million, with production slated for 1961. Initial output: about 1,500 bbls./day with provision for future production of xylenes and ethyl benzene.

COMPANIES

Fluorcarbon Co. is moving next month from Santa Ana, Calif., to larger facilities at Anaheim, Calif. New headquarters will house administrative, sales and engineering offices, as well as production department for Teflon and Kdl-F resins.

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Susquehanna Corp. (Chicago) has entered option agreements with Raindor Gold Mines, Ltd. (Toronto, Ont.) to conduct explorations of Raindor's Canadian mining properties (gold, silver, lead, zinc and minor amounts of copper and cadmium) located near Revelstoke, B.C.

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Becco Chemical Division of Food Machinery and Chemical is moving administrative and sales offices from Buffalo, N.Y., to FMC's Chemical Divisions headquarters in New York City.

•

Hooker Chemical (New York) has acquired Butler Chemical Co. (Galena Park, Tex.). Butler, near Houston manufactures defluorinated phosphate rock, an animal and poultry feed suplement. Terms and price of the acquisition were not disclosed and for the present the plant will be operated under the Butler Chemical name. Hooker nows own 14 U.S. and foreign plants, has joint interest in three others, including a recently announced phenol plant to go up in Argentina.

•

The St. Joe Paper Co. (Jacksonville, Fla.) has purchased Columbia Container Corp. (Baltimore, Md.) and its Richmond, Va., affiliate, bringing to 11 the number of plants operated by St. Joe.

FOREIGN

Pharmaceuticals/Europe: Three U.S. pharmaceutical companies are expanding European operations. American Cyanamid will start engineering studies this fall for an antibiotic fermentation plant in Sicily. Parke, Davis will sink about $1 million into a new combined manufacturing and sales unit near Bornem, Belgium, to serve the Benelux market. And Upjohn recently launched a subsidiary in Milan to promote its proprietary products.

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Urea/Russia: A Dutch company, Werkspoor of Amsterdam, will build three complete urea plants for the U.S.S.R. They will reportedly be the world's largest.

•

Chemical Imports/Egypt: In what is regarded as the first move in a plan to nationalize all importing and wholesaling firms, President Abdul Gamel Nasser has nationalized all pharmaceutical and chemical importing and distributing firms in the Egyptian sector of the United Arab Republic. From now on the government will import all drugs and chemicals and distribute them directly to retailers, hospitals, and local producers.

Owners of the nationalized firms will be compensated for stocks and investments plus 6% interest. Following the move, drug prices were cut 10%. Nasser says he will reduce prices by a total of 50% by next year.

•

Polyethylene, Pigments/Australia: Union Carbide Australia Ltd. will double planned capacity of its Altona polyethylene plant to 30 million lbs./year to meet rising demand, particularly in packaging. And Australian Titan Products Pty. will boost its titanium dioxide capacity to 22,000 tons/year. First stage of the expansion will be completed late next year, bringing capacity up to 16,000 tons.

Washington
Newsletter

CHEMICAL WEEK
July 30, 1960

A huge liquid hydrogen plant has been discussed by National Aeronautics and Space Administration in private talks with chemical companies. NASA contracted with Linde Co. a year or so ago for liquid hydrogen. Now, however, the agency finds it will need from 8 million to 10 million lbs of liquid hydrogen annually. This is about three times as much as Linde's new Torrance, Calif., plant can turn out. Use of liquid hydrogen in the upper stages of NASA rocket engines such as Saturn, Centaur, Rover, etc., spurs the need for more of the fuel.

Unconfirmed reports are that a plant the size the NASA wants built will cost around $25 million. It will ask companies to submit bids on a company-owned plant basis or to operate a government-built plant. A bidders' meeting is expected to be called within the next few weeks.

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A drastic change in labeling of prescription drugs is proposed by the Food and Drug Administration. Every package going to a druggist or doctor would have to contain an insert spelling out all the side effects, hazards and precautions. The information would not, however, have to be included in the package the patient receives.

Previously, such pertinent information had only to be available to the doctor and druggist in medical literature, or if specifically requested. The new rule would go a long way, FDA feels, toward overcoming rosy-hued promotion literature some drug firms put out concerning new products—a particular target of the Kefauver committee investigating drug prices. Pharmaceutical houses have 60 days to comment on the proposed measure.

In addition, FDA proposes to give itself authority to keep any new drug off the market until it has a chance to verify statements about purity, manufacturing controls, etc., submitted with the maker's application. At present it has to approve the drug if the data submitted is adequate. There have been instances of FDA finding out too late that the information submitted did not check with the facts.

•

Defense contracts will flow more freely in the next three months. It will be part of a subtle campaign by the Administration to stimulate business and make things look a little rosier as election day approaches.

Normally, this is a low-volume period for new military business. During July-October last year, for instance, procurement contracts dropped from the $1.9-billion average of the previous months to less than 1 billion.

This year a much higher rate of new orders is anticipated. Pentagon sources say this is what happened prior to the '56 Presidential election, and this is what they are expecting again.

In '56 there were no written orders—just a few strategically placed phone calls to procurement agents. Big projects that ordinarily

would be bogged down in red tape will now speed through the Pentagon's chain of command.

•

The Air Force is cracking down on inflated cost and price estimates made by contractors. It sent scorching letters to trade associations in the defense field complaining about inflated costs.

The complaints followed a special investigation of seven big contractors by the Air Materiel Command. Here's what was found: in four of the seven plants, unrealistic overhead costs charged to the Air Force; in three plants, no established estimating system to audit costs submitted by major subcontractors; in three firms, inflated material estimates; in two companies, refusal to submit cost breakdowns to justify estimates.

The inspection team was trying to find out how contractors are adhering to recently revised regulations covering contract pricing. The new rules set last December provide for tighter supervision of cost estimates. The AMC commander, Gen. S. E. Anderson, suggests that someone at corporation headquarters level, in companies where management has decentralized pricing operations, be made responsible for over-all operations. The tone of his letter is tough and uncompromising.

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New England industries are protesting oil import restrictions, which they say are responsible for the recent 15¢/bbl. price hike in residual fuel oil. The New England Council, representing industry—which is heavily dependent on oil for industrial fuel—told the Interior Dept. last week that import restrictions are too severe. They were backed by Sen. Everett Saltonstal (R., Mass.), who suggested that New England be given separate allocations from other Atlantic Coast states, which have alternative fuel supplies.

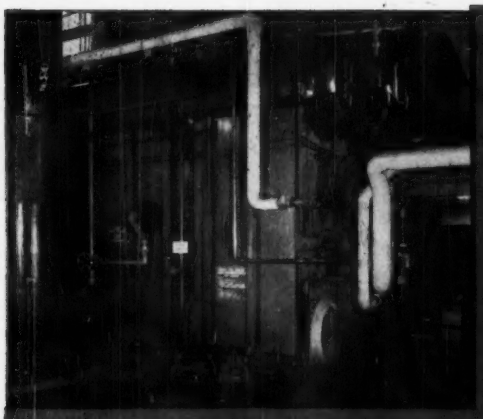
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Domestic sugar supplies and prices are expected to stabilize in the aftermath of last week's Agriculture Dept. reallocation of foreign import quotas under the Sugar Act. The new allocations, which cover only the '60 crop year, will assure adequate supply even for increased consumption estimates of about 10 million tons, predict government experts.

The new quotas more than make up for the 700,000 tons cut from Cuba's share of the U.S. market, as well as crop shortages in the Philippines.

•

Scientific opinion on issues such as food additives and radiation should be more effectively communicated to the public. That's the conclusion of a special report of the American Assn. for the Advancement of Science. Although scienitfic decisions are figuring more prominently in public issues, politicians are more swayed by ill-informed public opinion than by scientific judgment. The report recommends more public symposia, more articles written for general consumption, more scientific liaison with civic organzations at the local level.



A 15,000 lbs/hr unit in a boxboard plant



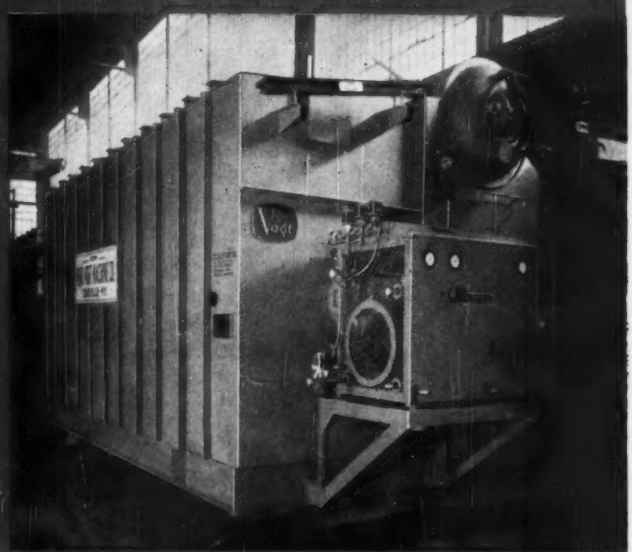
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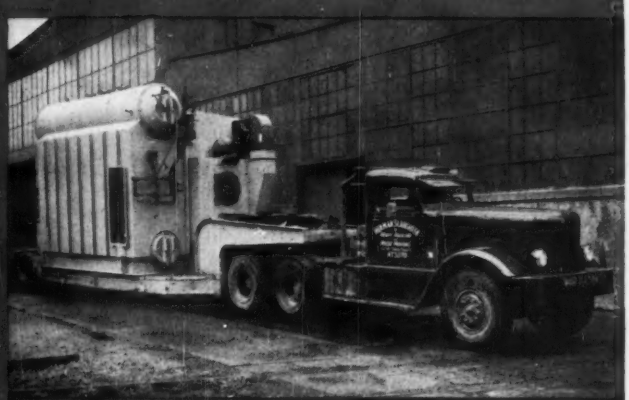
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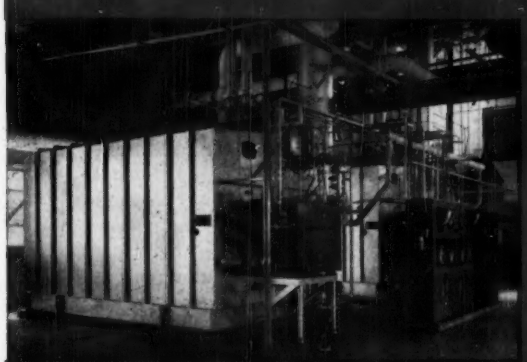
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Scorecard on Leading U.S. and Foreign Fuel Cells

Type	Hydrogen-Oxygen (Aqueous Electrolyte)		
Developer	National Research Development Corp. (England) with United Aircraft and Leesona Corp.	Union Carbide Corp.	Brunswick Technical Institute with group of German companies
Anode	Porous sintered nickel	Porous carbon	Porous Raney nickel with nickel carbonyl
Cathode	Porous nickel with lithium oxide	Porous carbon	Porous Raney silver
Fuel source	Hydrogen	Hydrogen	Hydrogen
Electrolyte	27% Potassium hydroxide	50% Potassium hydroxide	27% potassium hydroxide
Operating temperature (C)	200-240	20-80	20-80
Pressure (psi.)	300-600	14-70	14-70
Emf. (v.)	0.6	0.8	0.7
Current density (amps./sq. ft.)	135-630	18-180	18-180
Power output per unit volume (watts/cu. ft.)	8,200	190-270	—
Power output per unit weight (watts/lb.)	9.1	1.8-3.2	—
Testing time (hrs.)	1,500	8,000	4,000

**Practical long-term performance estimated by Bonn University's Wolf Vielstich*

Foreign Fuel Cell Advances Spur

Fuel cell research—a $3-million project by the U.S. Defense Dept. and its branches, and a high priority effort by U.S. private companies—is an international undertaking. That was made clear by a dispatch just in from CW's Bonn bureau on direct conversion of chemical to electrical energy. Professor Wolf Vielstich of Bonn University (Germany) revealed the latest developments in foreign research (see table, above), tied in the work with American efforts.

Vielstich points out that probably the best known work is being carried on in England by Francis Bacon in cooperation with the National Research Development Corp. (London). But, he adds, Germany and the Netherlands are also deeply involved, and background for one of the leading cells in the U.S. was developed in Austria. The Soviet Union is also known to be working on fuel cells, but current information is skimpy. And a host of industries, intrigued by the cells' potentially wide applicability—e.g., power systems for satellites, farm and industrial vehicles, automobiles, remote installations—are spurring the work (*CW, July 25, '59, p. 45*).

British Pacesetter: Bacon, who has been working on fuel cells since 1932, has developed a high-temperature, high-pressure cell that produces electricity by reacting hydrogen and oxygen in 27% potassium hydroxide. Electrodes are made of porous nickel with the oxygen electrode (cathode) containing lithium oxide.

Bacon has reported these results, when operating at 240 C and 800 psi.: current density of 1,000 amps./sq. ft. at an electromotive force of 0.6 v.; 670 amps./sq. ft. at 0.7 v.; 384 at 0.8; and 151 at 0.9. Vielstich estimates that, for practical long-term use, a current density of 135-630 amps./sq. ft. can be achieved at temperatures of 200-240 C and pressures of 300-600 psi. Bacon has operated up to 40 cells in series and reached a maximum power output of 10,000 watts/cu. ft. at an emf. of 0.68 v. and a current of 440 amps. On a weight basis, power output is estimated at about 9 watts/lb.

U.S. interest in the Bacon cell is sharpened by the fact that two American companies are cooperating with the British workers. Last fall, Pratt & Whitney Aircraft, division of United Aircraft Corp. (E. Hartford, Conn.), and Leesona Corp. (Cranston, R.I.) — formerly called Universal

Hydrogen-Oxygen (Ion-Exchange Membrane)		Molten Salt	Regenerative	Consumable Electrode
General Electric	Bonn University (Germany)	T.N.O. (Netherlands)	Mine Safety Appliances Research Corp.	Western Reserve University and Union Carbide Corp.
Platinum	Raney nickel (alkaline) or carbon with 10% platinum (acid)	Platinum powder, nickel or nickel and iron (depending on fuel)	Porous stainless steel	Sodium amalgam
Platinum	Precipitated silver (alkaline) or carbon with 10% platinum (acidic)	Silver powder with 10% carbon dioxide	Molten lithium	Porous carbon
Hydrogen	Hydrogen	Hydrogen, carbon, carbon monoxide, methane, ethane	Lithium hydride	Sodium amalgam
Ion exchange resin	Amberplex resins	Magnesium oxide with 40% carbonates	Molten lithium salts	20% Sodium hydroxide
20-80	20-80	500-800	450 (850 for regeneration)	45
Atmospheric	17	Atmospheric	Atmospheric	Atmospheric
0.8-.9	0.65	—	0.3-0.66	1.4
2.7-27	2.7-9.3	9.3-93	Up to 135	22.5-135
820	410-820	4-0-820	200	—
9.1	—	—	7	—
10,000	1,400	4,500	—	280

Electricity-from-Chemicals Race

Winding Co.—joined forces with Britain's National Research Development Corp. on the hydrox (hydrogen-oxygen) cell, extended the field of cooperation to all types of fuel cells in January. NRDC and Leesona (through its Patterson-Moos Research division) will carry on chemical and electrochemical research, while P&WA is responsible for mechanical and systems development, manufacture and sales.

Austrian Transplant: The low-temperature (20-80 C), low-pressure (14-70 psi.) hydrogen-oxygen cell being developed by Karl Kordesch at Union Carbide Corp.'s Parma, O., research center, is based on background gained by Kordesch while he was doing related work at Wiener Isolierrohrfabrik (Vienna). This system uses as electrodes porous carbon plates with catalyst included. Fuel is hydrogen and the electrolyte is 50% potassium hydroxide.

Vielstich's estimate of long-term current density is about 18-180 amps./sq. ft. at an emf. of about 0.8 v., and he pegs power output at 190-270 watts/cu. ft. and 1.8-3.2 watts/lb. Carbide says that its latest long-term results (based on over 15,000 hrs. of testing at various current densities) indicate power outputs of 500 watts/cu. ft. and 6.3 watts/lb. Best current density achieved is 100 amps./sq. ft. at 0.85 v. when reacting the hydrogen with oxygen, 40 amps./sq. ft. at 0.8 v. when using air. Principal advantage over the Bacon-type cell is the more convenient temperature and pressure range.

German Contenders: Eduard Justi of Brunswick Technical Institute (Germany) is working with a German consortium on another low-temperature-and-pressure cell. Key is a "double skeleton catalyst" (DSC) anode, which consists of a sintered mixture of nickel and nickel carbonyl from which aluminum has been dissolved to leave the "double skeleton" of active nickel and nickel carbonyl. The cathode is made of Raney (spongy) silver and the electrolyte is 27% potassium hydroxide. Current density is estimated at 18-180 amps./sq. ft. at 0.7 v. Vielstich and Gerhard Grüneberg of Ruhrchemie AG. (Oberhausen) have developed a cell for liquid fuel (e.g., ethylene glycol) with electrodes consisting of two nickel sieves and a layer of Raney nickel between them. Current density is 2.7-27 amps./sq. ft. at an emf. of 1.1 v.

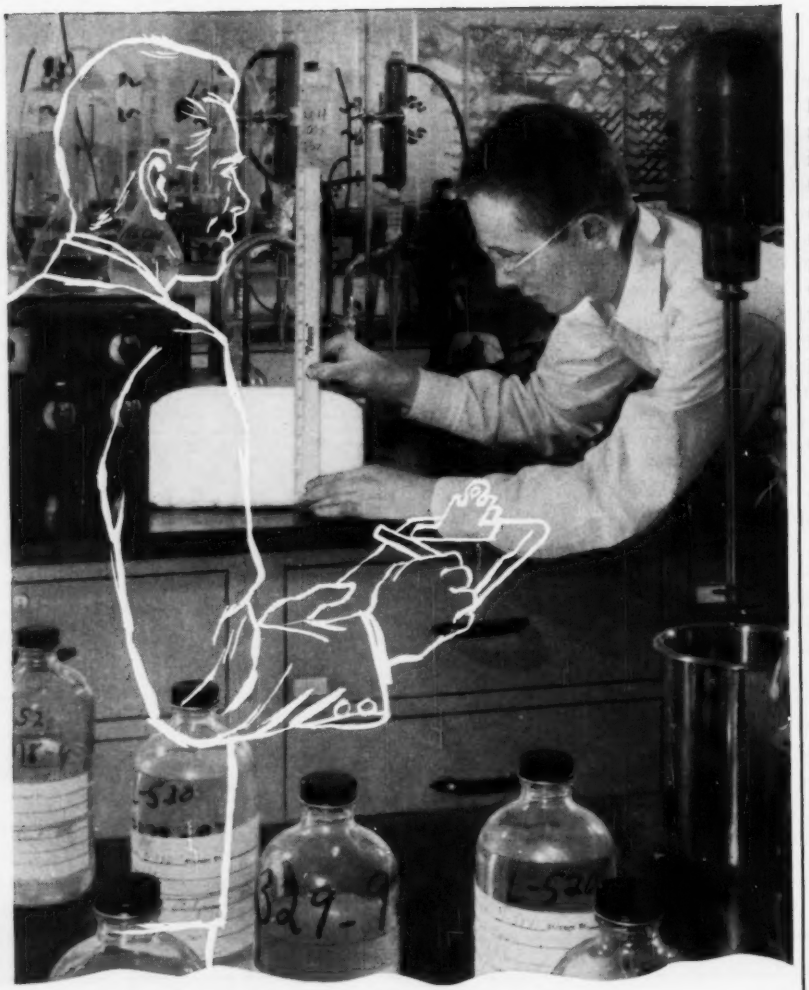
Another type of cell Vielstich is

working on is the ion-exchange membrane (solid electrolyte) type, similar to that which General Electric Co. is developing in this country. The German cell operates in either an acidic or an alkaline medium with an appropriate Rohm & Haas Amberplex ion exchange resin. If acidic, the electrodes are both carbon containing 10% platinum; if alkaline, the anode is Raney nickel and the cathode is precipitated silver. Current density is 2.7-9.3 amps./sq. ft. at 0.65 v. and power output is 410-820 watts/-cu. ft.

Carbon Burners: Carbox cells—which burn carbon, carbon monoxide and hydrocarbons as well as hydrogen and generally use molten salts as electrolytes—are under active development both in England and in the Netherlands, says Vielstich. H. H. Chambers of Sondes Place Research Institute (Dorking, England) is working on two types. One is a porous diaphragm cell with an electrolyte consisting of an eutectic mixture of sodium and lithium carbonates incorporated in a porous sintered magnesia disk with 50% porosity and pore size of 25 microns. Electrodes are 20-mil plates of silvered zinc oxide.

The other type of cell uses free molten electrolyte with Bacon-type electrodes. Fuels that have been used successfully with these cells include hydrogen, carbon monoxide, water gas and methanol vapor. Kerosene vapor and propane-water mixtures were less successful, and methane and benzene were ineffective. Operating at high temperature (e.g., 500 C) and about atmospheric pressure, these cells have shown current densities of 140 amps/sq. ft. at 1.0 v. and power output of 1,000-1,600 watts/cu. ft.

J. A. A. Ketelaar of Central Research Institute T.N.O. (The Hague) also has worked on a molten salt cell. He uses carbonates of lithium, sodium or potassium or their mixtures in a sintered magnesia disk. Volume porosity is 40-50%; alkali content is about 40%. The electrodes are 1-mm. layers of metal powders covered with gauze. The anode is nickel-covered platinum; nickel or nickel and iron, depending on the fuel used (hydrogen, carbon monoxide, carbon, methane or ethane), while the cathode is all silver. Reported current density is 135 amps./sq. ft., but



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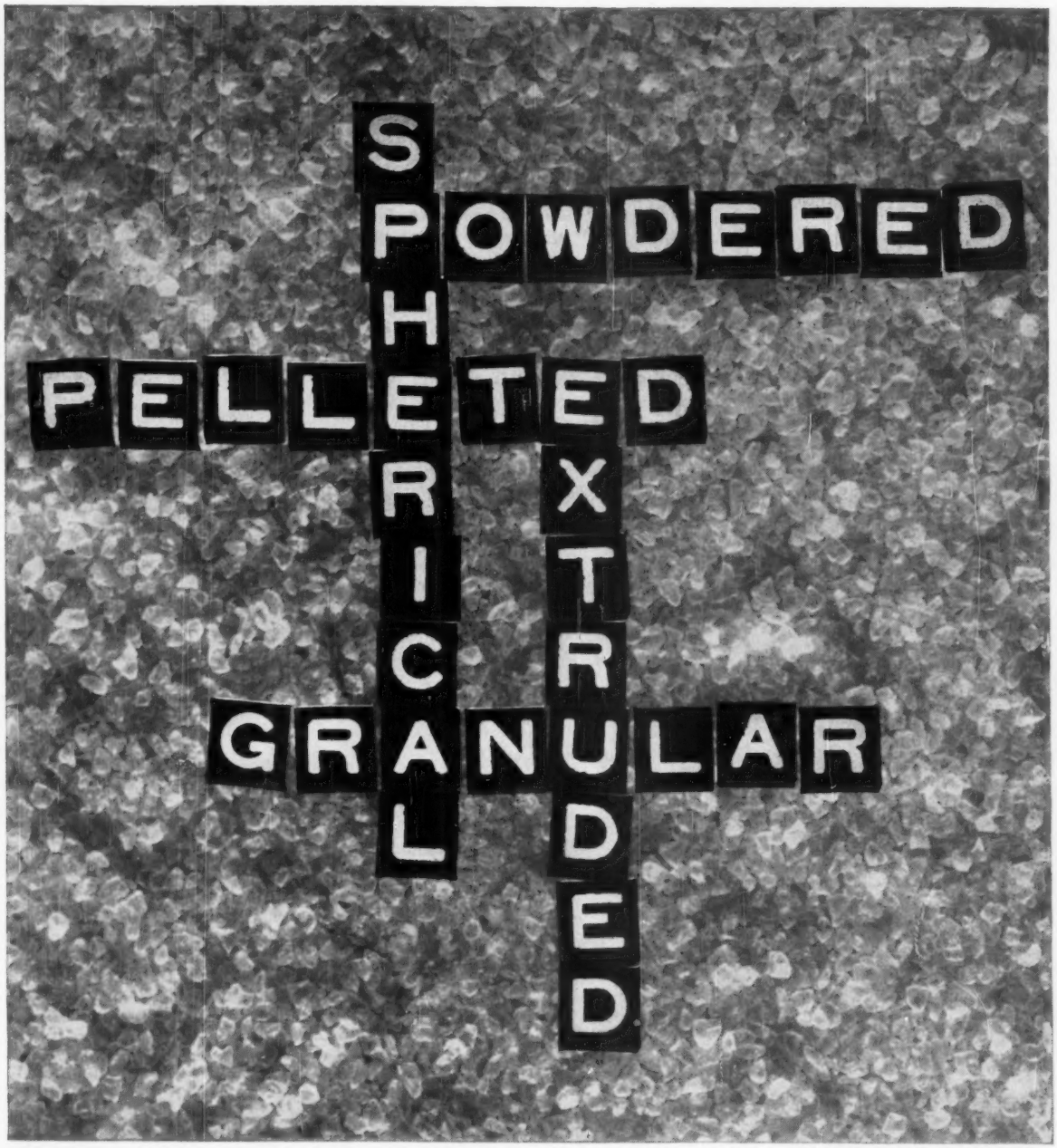
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Vielstich estimates a range of 9.3-93 amps./sq. ft. as being more practically obtainable. He estimates power output at 410-820 watts/cu. ft.

American Leaders: Vielstich singled out three American developments for special attention. One was the General Electric membrane cell, which he estimated would operate at 0.8-0.9 v. He figured the corresponding current density at 2.7-27 amps./sq. ft. and power output at 820 watts/cu. ft. and 9.1 watts/lb.

Another was the Mine Safety Appliances Research Corp. (Pittsburgh) regenerative cell, which uses lithium hydride as the source of hydrogen fuel and fused lithium salts as electrolyte. Operation at 450 C and atmospheric pressure gives a current density of up to 135 amps./sq. ft. at 0.3-0.66 v., according to Vielstich's estimate. The company says it can achieve 450 amps./sq. ft. at 0.3 v. and a power output of about 200 watts/cu. ft. and 7 watts/lb.

The third U.S. cell noted by Vielstich is the consumable electrode type developed by Western Reserve University and Union Carbide Corp. This cell uses sodium amalgam as the anode (porous carbon is the cathode), with the sodium also serving as the fuel. Electrolyte is 20% sodium hydroxide. Vielstich's estimates: current density of 22.5-135 amps./sq. ft. at 1.4 v.

Other Contenders: Many other U.S. companies are well along on fuel cell development. Allis-Chalmers Mfg. Co. (Milwaukee) used over 1,000 propane-burning cells to power an experimental tractor last year (*CW Technology Newsletter, Oct. 24, '59*), and Exide Industrial Division of Electric Storage Battery Co. (Philadelphia) recently demonstrated a cell fueled by zinc powder (*CW Technology Newsletter, June 4*).

Chrysler Corp. (Detroit) has developed an electrode with one-way porosity (to prevent flooding by the electrolyte). And The Electric Auto-Lite Co. (Toledo) is working on a cell that would utilize air and a fuel such as propane at atmospheric pressure and temperature. Auto-Lite is currently using a sintered nickel anode and an activated carbon cathode.

With fuel cell research holding top priority in many laboratories in this country and abroad, a practical device is only a matter of time.

MANUFACTURING OPPORTUNITY

The N-DUR Process* is a new process of applying a protective wear-resistant coating to asphalt and paved surfaces. Parking lots and driveways treated by the N-DUR Process are highly resistant to grease, oil, gasoline, water and grit. The process has been successfully used by such companies as: Standard Oil of Indiana, Gulf Oil Co., and Cities Service Oil Co. These users have found that the coating adds years to the life of the surface and it is attractive and easy to clean. Colors available are: Silver, Gold, Green, Red and Black.

The developer of the Process wishes to sell the patent rights and registered trade marks to a responsible company. He also wishes to take a position with the purchaser in the fields of product development, marketing or technical sales. He has 20 years of experience in the manufacturing and marketing of coatings, finishes and adhesives. For complete information write to: Chemical Week, BO-4732.



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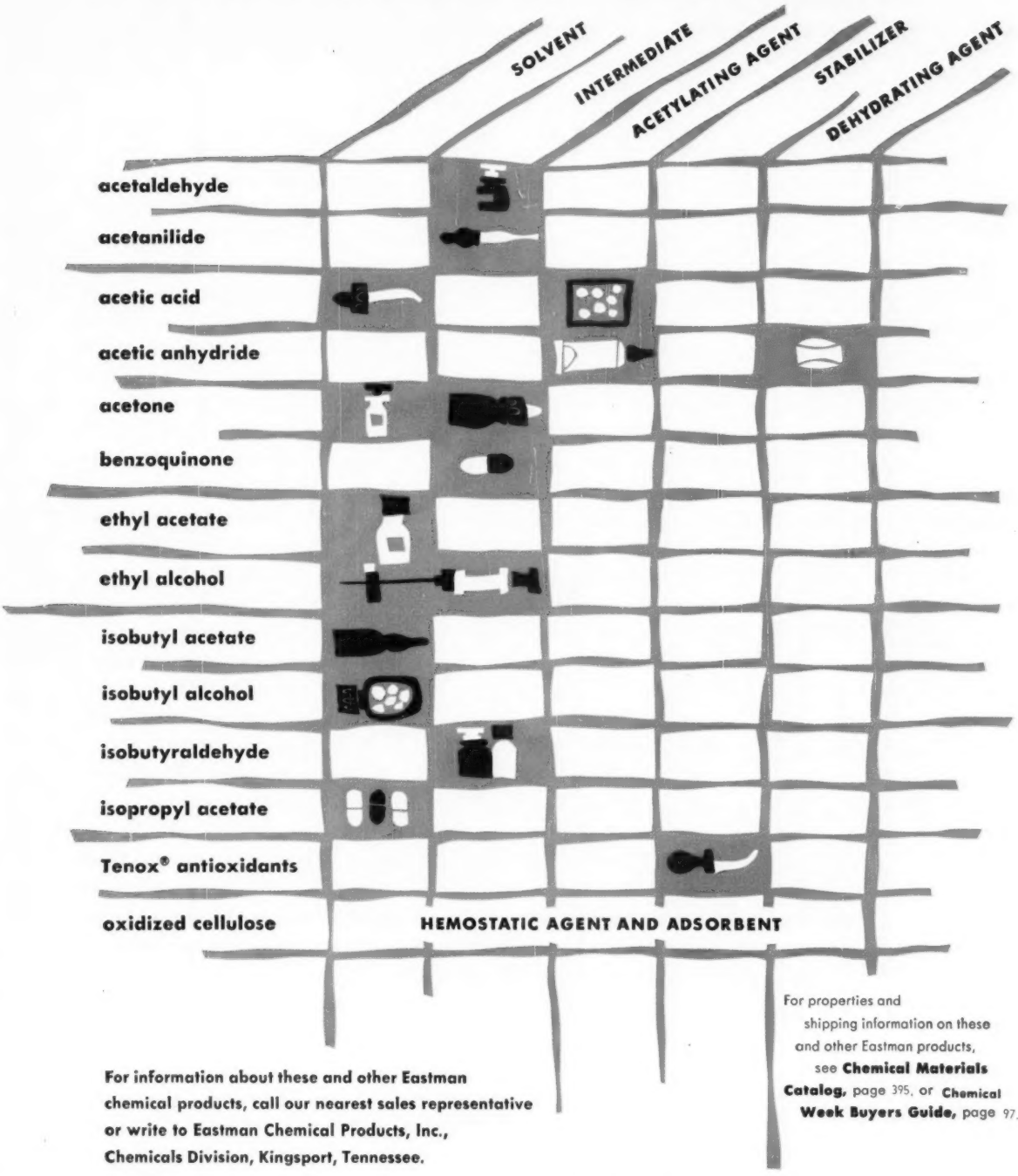
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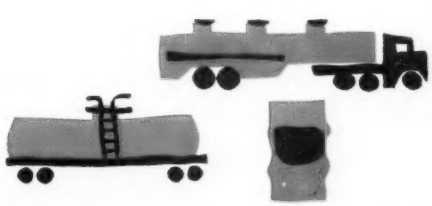
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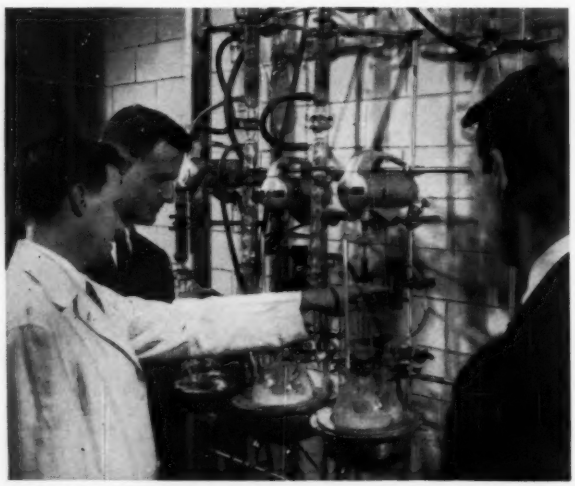
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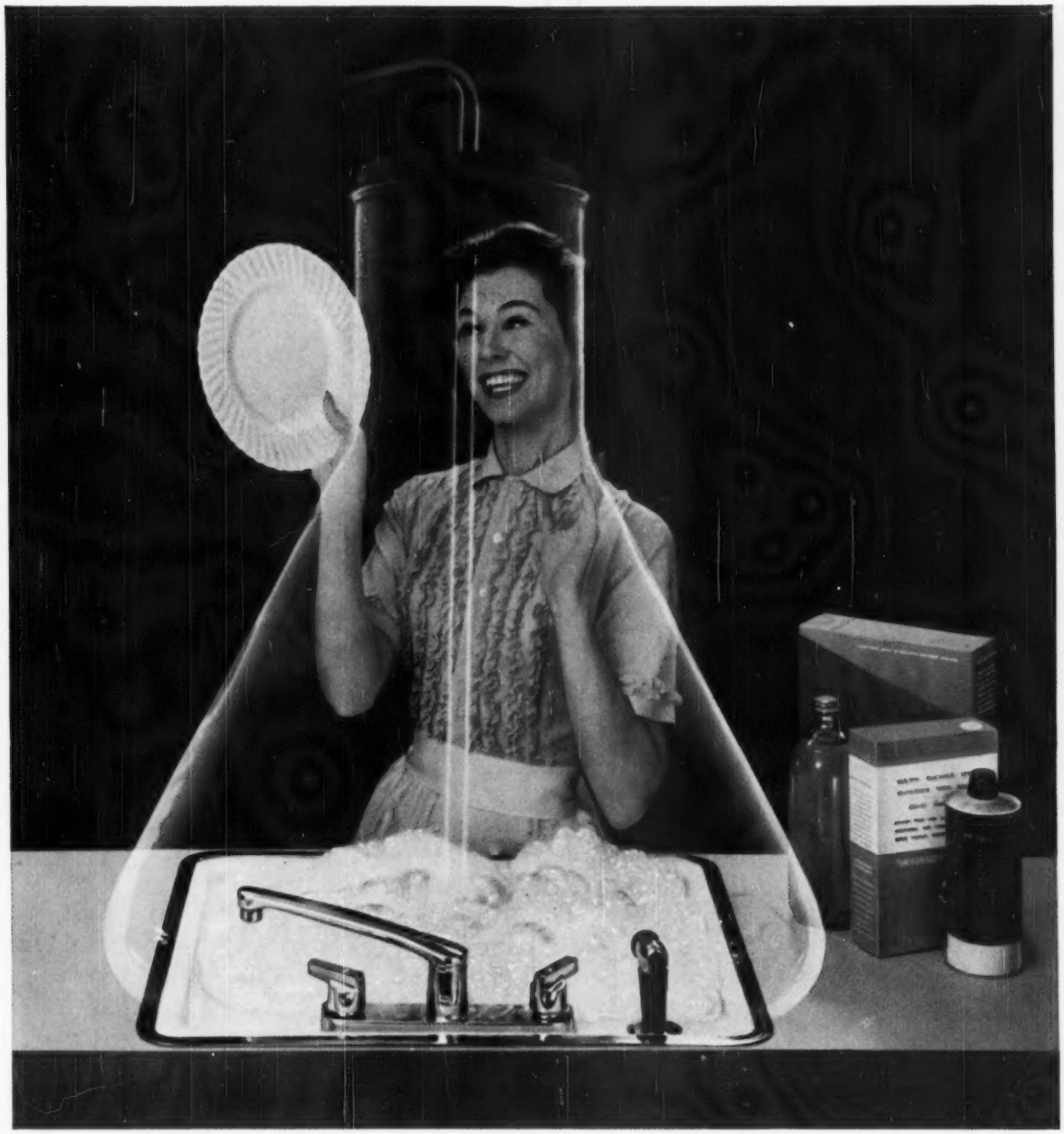
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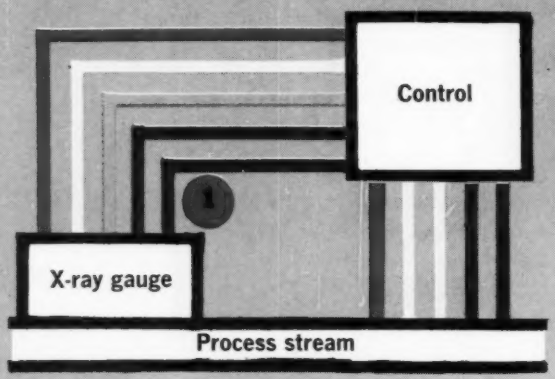
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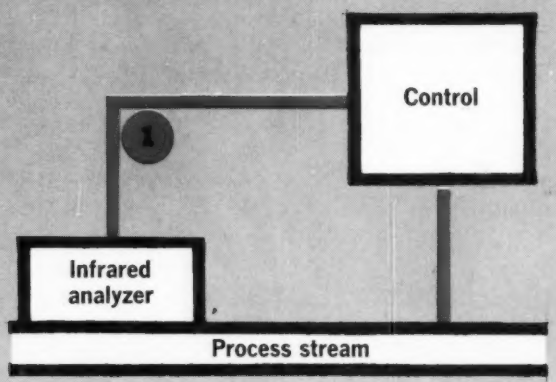
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How new x-ray gauge differs from other stream analyzers

In continuous, direct monitoring

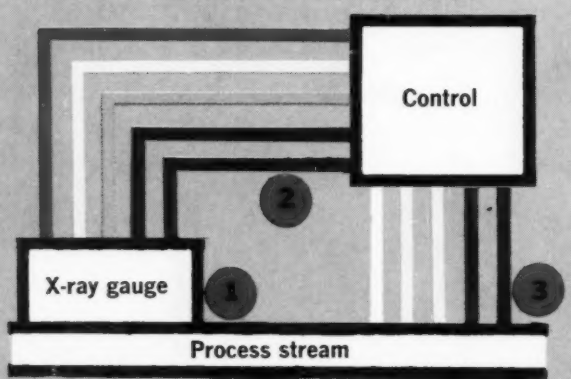


1. X-ray measures up to five elements in stream.

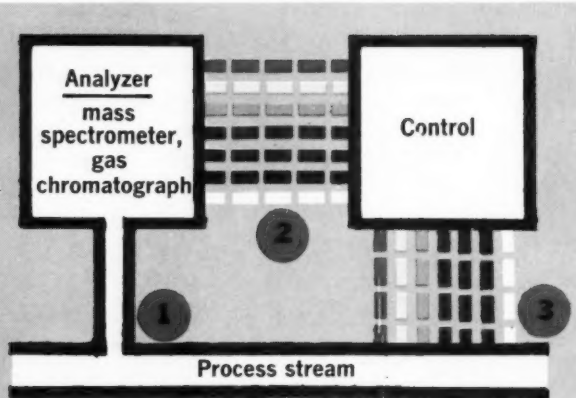


1. Infrared measures an element or sum of elements

In multicomponent monitoring



1. X-ray gauge is placed directly on stream.
2. X-ray gauge measures elements continuously.
3. Control of process stream is continuous.



1. Sample is drawn out of process stream.
2. Analyzers measure components intermittently.
3. Control of process stream is intermittent.

Now: X-Ray Insight Goes Onstream

This week, General Electric's X-Ray Department (Milwaukee, Wis.) is launching a drive to move its new X-ray emission gauge into chemical process industry plants as a process stream analyzer. Its promise — of moving the analytical laboratory onto the production line—has been made before by manufacturers of other types of analyzers (*CW, May 19, '56, p. 138*). But the drawings above show why GE's promise may be more than just an echo from the past.

The X-ray gauge differs from most other analyzers because it measures elements (atoms) in the process stream rather than compounds (molecules). And the gauge can be used directly on the process stream for simultaneous quantitative analysis of up to five elements (six elements if a reference isn't used). This permits continuous control of the process stream.

Infrared analyzers can be used directly on the process stream for continuous control. But they only measure one component or the sum of a number of components. Multicomponent analyzers, such as the mass spectrometer and gas chromatograph, generally measure samples

that have been withdrawn from the process stream. And they analyze components consecutively, which means only intermittent stream control.

GE says the X-ray gauge can be used for liquids, slurries, gases and solids—in the form of dry or moist powder, sheets, wires or rods. It sees major application in mining, cement, petroleum, steel, chemical and pharmaceutical operations. First installations will be in mining for the measurement of the copper lost in tailings, in steel-making operations for measurement of iron, silicon, sulfur and calcium. Cost of the gauge: $40,000-50,000 (uninstalled).

This cost of the X-ray gauge makes it one of the most expensive process-stream analyzers offered. Some infrared analyzers sell in the $2,000 range, although about $5,000 is a more common figure. Gas chromatographs generally sell in the $5,000-10,000 range, mass spectrometers from $5,000 to about $40,000.

Stiff Tab: Just how much of a factor cost will be remains to be seen. It is not out of line with other X-ray analysis equipment now on the market.

Typical units sell in the $25,000-and-up category, and these have already found a place in analysis and control work. Laboratory models are made by companies such as GE, Applied Research Labs, Philips Electronics (formerly North American Philips), Picker X-Ray and RCA. Philips, for example, sells an automatic analyzer called the Autrometer that will measure 24 elements consecutively for about $55,000.

The lab units are often used for quick analysis of batch operations. For example, constituents in lube oil can be determined in less than five minutes, quickly enough to catch problem situations before real trouble starts. However, many companies say they can't justify high cost instruments, except for research and contend the tag on control lab instruments shouldn't exceed $5,000 (*CW, Nov. 15, '58, p. 53*).

On chemical plant process streams, there is some indication that cost may be a troublesome limitation, too. Philips has made X-ray analyzers for continuous measurement of tinplate thickness in can-making operations for about five or six years, has had an analyzer measuring two elements in tailings in a Consolidated Mining and Smelting mining operation in British Columbia for about 18 months. And although it has talked to some chemical companies there have been no takers as yet, according to Philips spokesmen.

In the tinplate operation, the Philips X-ray analyzer has two heads, one for measurement on each side of the sheet, and in the tailings operation, two elements are measured. The GE unit is the first one to analyze for five elements directly on the process stream.

Peek at Process: The material to be analyzed flows past a specially constructed X-ray-transparent window in the pipe or conveyor where it is bombarded by X rays from the unit's 36x30x24-in., 250-lb. measuring head that has been placed over the window. Each element of the material emits its characteristic radiation—to a degree dependent on concentration—which is picked up by the six detecting channels also in the measuring head.

The characteristic radiation signal is amplified in the unit's electronic cabinet so it can be recorded or channeled to a data logger, computer or controlling device.

The speed of measurement varies from a fraction of a second to 20 minutes, depending on the type of measurement and the accuracy desired. Accuracies of 0.5% are possible.

However, GE points out that if short-term variations in a continuous flow are to be studied, the brevity of time just won't allow maximum accuracy. High accuracies and long-term variations require more time. Generally, analysis time will vary from about 10-20 seconds to one minute.

Lightweight Barrier: And only elements from aluminum, atomic number 13, on up the atomic table can be measured by the new GE gauge; many organic materials can't be analyzed at all. As with all X-ray analyzers, the length of the wavelength that is characteristic of any element below atomic number 20 (calcium) can't penetrate air for any distance because it is absorbed. For measurements from calcium down through aluminum, GE and others introduce a gas with low absorption, such as helium, or draw a vacuum.

Philips reports that it now has some experimental lab analyzers that will measure elements below atomic number 10, and that it is hopefully aiming for carbon (atomic number 6) in the not too distant future.

X-ray analyzers have another problem. The depth of material they can measure is not always great, is limited by the type of material. GE will only say that its new gauge will measure relatively thin layers. This might mean that with some materials, part of the process stream might have to be diverted to obtain a test stream that can be measured accurately. GE, like other stream analyzer makers, points out that the manner and form in which the sample is presented to the analyzer is the most critical consideration of the analysis setup.

Problems for All: X-ray analyzers, however, aren't the only ones with certain drawbacks. Infrared analyzers, for example, are finding only limited use in direct process stream applications because of interference by other materials having absorption spectrum similar to that of the key component being measured. Mass spectrometers and gas chromatographs are limited to compounds of relative high volatility.

Some mass spectrometers will analyze several substances simultaneously but the more common use for instruments such as those put out by

Consolidated Electrodynamics, Beckman Instruments and Bendix Aviation's Cincinnati Division is in periodic checks of process streams for many components. Union Carbide Chemicals, for example, uses the mass spectrometer at Institute and South Charleston, W. Va., to run complete analyses for more than 30 possible constituents in samples (*CW, Nov. 15, '58, p. 53*). One drawback for many plants: recording oscillographs with manual data reduction and hand calculation are time consuming, costly. Carbide uses a Teletype system to speed mass spectrometer data to its computer laboratory for check out. Some complete analyses are finished in 15 minutes.

Improvements Spur Popularity: Gas chromatographs are on the upswing in process stream analysis. For example, Perkin Elmer reports that the types of materials being analyzed are quadrupling each year. PE says its instruments are now used for analysis of parts of 15 different processes, such as alkylation, sulfur recovery, ammonia synthesis, and butadiene, polyethylene and ethylene oxide production.

Usually four or five compounds are analyzed but sometimes the figure is as high as eight. And PE says that all gas chromatograph makers have increased analysis speed of their instruments about 15 times over the past year by reducing the size of samples, the valving and the piping. Analyses that were taking 15-30 minutes a year ago now take one or two minutes as a result of the instrument miniaturization.

Compared with gas chromatograph, mass spectrometer and infrared analyzer, the X-ray analyzer may offer advantages, such as speed and continuous, multi-element control of process streams. But if it follows the development pattern of these analyzers, and other more specialized instruments such as ultraviolet analyzers and continuous refractometers, the X-ray units will find a new niche, rather than compete with the others.

It is axiomatic that each process stream analysis job is highly specialized, suited best to a particular type of analyzer. The addition of X-ray gauges to direct process stream analysis gives the chemical industry another instrument from which to choose.

EQUIPMENT

Sheet Processing: The Princeton Division of Curtiss-Wright Corp. (P.O. Box 110, Princeton, N.J.) is out with two new instruments for processing sheets of paper, rubber, plastic, etc. One instrument, an automatic bump detector, will detect defects such as slime spots, bumps, coating lumps, cuts, wrinkles and folds on sheets traveling at speeds up to 2,000 ft./-minute. The electronic control device has a 6-in. wide stainless steel sensing head that skids along the sheet as it passes over a roller. The head exerts 4 grams of pressure per 6-in. length of surface of sheet, detects protrusions as small as 0.0001 in.

The other instrument is an automatic void detector that has 6-in. wide metal brushes mounted in the same manner and exerting the same surface pressure as the bump detector. Voids as small as 0.010 in. can be detected. The electronic components of both instruments contain built-in trouble lights which indicate instrument malfunctions. And in the event of a sheet break, the sensing units of both instruments are automatically lifted from the sheet to avoid pile-ups.

•

Speed Reducers: Hewitt-Robins Inc.'s (666 Glenbrook Road, Stamford, Conn.) new line of spiral bevel speed reducers are claimed to take up less floor space than other reducers, permit the prime mover to be placed alongside the equipment. Energy loss for a single reduction unit is about 2%, for a double reduction unit, about 3%, and for a triple reduction unit, about 4%.

•

Tank Liner: National Vulcanized Fibre Co. (1060 Beech St., Wilmington, Del.) is now offering extruded Penton sheets in 48-in. wide rolls for lining tanks and other equipment. Previously available only in narrow widths, the new rolls cut down the number of seams needed for lining. National also supplies Penton welding rods, seamers and corner strips.

•

Feedwater Heaters: A newly designed feedwater heater with a hemispherical inlet chamber and a new type of joint between tubes and tube sheet that minimizes thermal stresses is available from Westinghouse Electric Corp. (P.O. Box 2099, Pittsburgh 30, Pa.). The new joint, developed originally for construction of nuclear steam generators, sandwiches layers of nickel and nickel-copper alloy between tubes and tube sheet to give strong, reliable welds. In the old method, the tubes were welded directly to the tube sheet. The new method can be used for carbon and austenitic-stainless steels, and for copper-nickel and high-nickel alloys.

•

Rupture Disks: Falls Industries, Inc. (Solon, O.) has added 1- and 1½-in. diameter disks to its line of impervious graphite rupture disks. The new disks come in 17 burst ratings to 300 psi., with or without vacuum supports. Accuracy: ±5% of set burst pressure at temperatures from —400 F to 300 F.

•

Electric Starter: Square D Co. (4041 North Richards St., Milwaukee 12) is out with a new NEMA Size 00 starter for equipment from ¾ hp, 110 volts to 2 hp, 440/550 volts in three-phase service. The starters cost less than Size 0 starters (previously specified for this service).

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Pitot Tube: A new pitot tube with a compressed air blow-out system for cleaning is offered by the F. W. Dwyer Manufacturing Co. (P.O. Box 373, Michigan City, Ind.) for measuring air and gas velocity and pressure in dry-dust laden atmospheres. A three-way valve prevents blow-out pressure directed toward gauge or manometer. The unit is made of brass and stainless steel, is silver-soldered for operation to 800 F.

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Industrial TV: A small, lightweight portable television camera for industrial use under conditions of low light levels, is a new development of the Dage Television Division of Thompson Ramo Wooldridge, Inc. (Michigan City, Ind.). The camera has completely transistorized circuits, weighs only 15 lbs.

•

Four-Way Air Valve: Mechanical Air Controls, Inc. (10030 Capital Ave., Detroit 37) is out with a new three-position, four-way air valve that has an air-actuated device for "inching" the valve into any desired position. The valves operate in vacuum service or at pressures up to 150 psi., have ⅜-in. ports.

Progress Report...

—Divinyl Sulfone
—Butyl Acetate
—TERGITOL E-35
—Diethyl Amine

New reactive monomer

A new reactive monomer is on the scene. And, its valuable properties should put it in every evaluation lab where new resins are being made. This new monomer is divinyl sulfone, and it looks like this:

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Divinyl sulfone undergoes both vinyl and condensation reactions. It is very reactive because of the activating influence of the oxygen atoms on the double bonds.

Divinyl sulfone reacts with compounds containing active hydrogens, such as amines, alcohols, and polyols. This CARBIDE monomer forms polymers with diols—from ethylene glycol to the higher polyglycols, with urea, and with malonic esters. These polymers range from viscous oils to hard resins and show promise as textile fibers, adhesives, and film formers.

Divinyl sulfone will cross-link cellulosic textiles such as cotton and rayon. It is strongly indicated that this gives shrink-resistance to the cloth.

Cross-linked polymers, varying in the degree of fusibility and solubility, can be obtained by copolymerizing divinyl sulfone in amounts up to ten per cent of the polymer composition.

Using a free radical catalyst, divinyl sulfone can be copolymerized with the common active monomers such as acrylamide, acrylonitrile, acrylic esters, butadiene, styrene, vinyl chloride, and vinyl esters.

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When you buy butyl acetate, save money by ordering it with other CARBIDE solvents to fill a compartment tank car or truck. Call the Technical Representative in your nearest CARBIDE office for details and prices. To help you choose the best solvent for your particular needs, write for a copy of CARBIDE's "Solvent Selector." It contains useful facts about more than 70 different solvents, couplers, diluents, and plasticizers.

New surfactant for detergent compounding



CARBIDE's research in surface active agents has brought forth several new nonionics with characteristics particularly suitable for detergent-making. One of these, TERGITOL E-35, is a caustic-stable nonionic developed especially for use with *dry* alkaline compounds, such as flake caustic or sodium metasilicate. The cloud point of a 0.5 per cent solution of E-35 in distilled water is 35° C. Its low foaming and good wetting action make this new TERGITOL surfactant highly effective in detergents intended for heavy-duty cleansing, such as bottle washing, metal cleaning, and commercial dishwashing.

TERGITOL nonionics can be effectively combined to obtain the many special qualities desired in a detergent. A Technical Representative in any CARBIDE office will be glad to give details on the new TERGITOL nonionics, as well as other CARBIDE chemicals for detergents. For a technical bulletin on TERGITOL E-35, use the coupon above right.

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Looking for an intermediate for pharmaceutical synthesis or for making dithiocarbamate rubber accelerators, insecticides, dyestuffs, textile finishing agents, corrosion inhibitors, or anti-skinning agents for air-dry enamels?

Why not diethyl amine? It has a boiling point of 55.5°C. at atmospheric pressure, freezes at −49.8°C., and is completely soluble in water at 20°C.

Check the coupon for a copy of Technical Information Bulletin F-7408, which contains more information about CARBIDE's ethyl and isopropyl amines.

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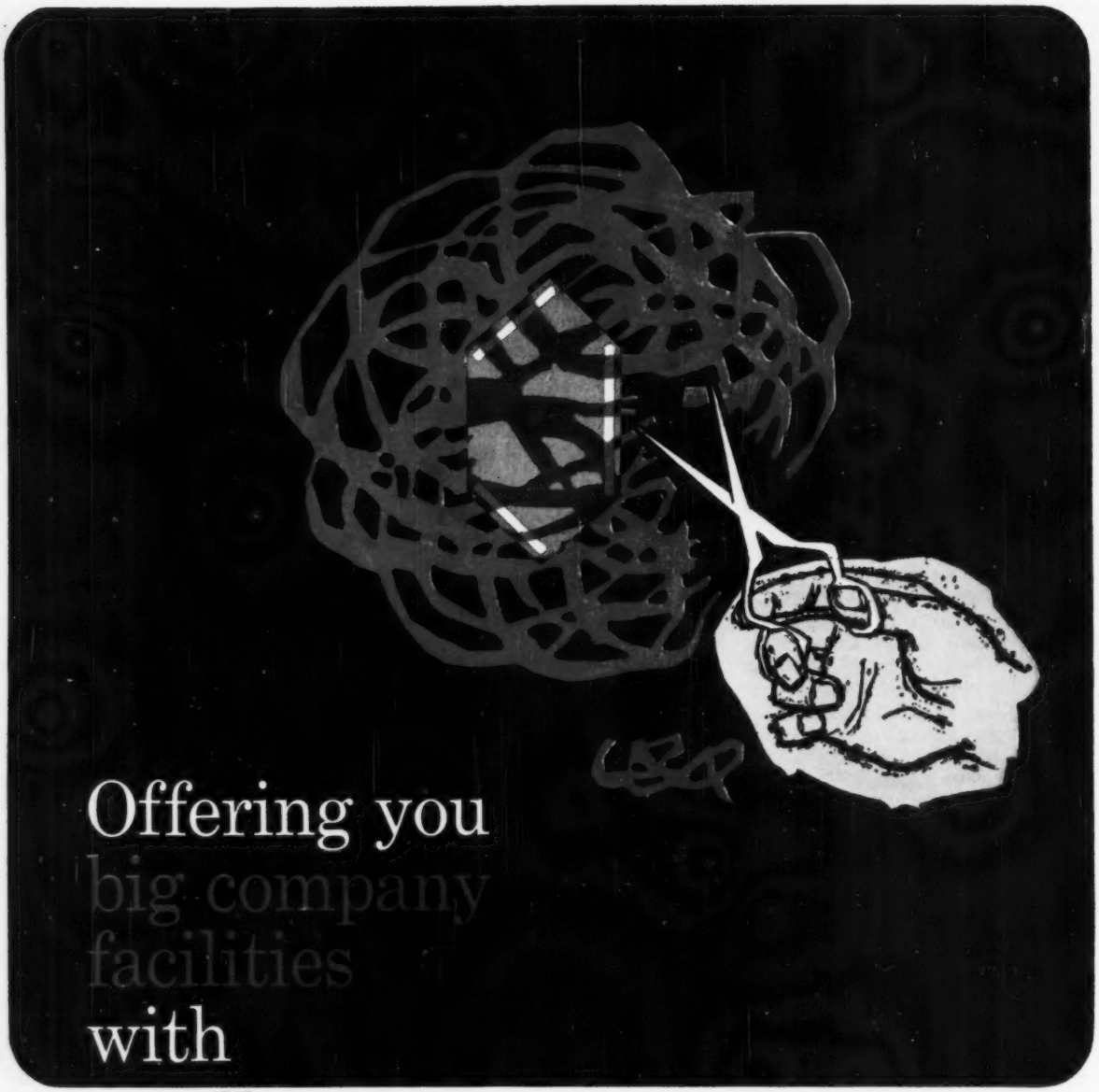
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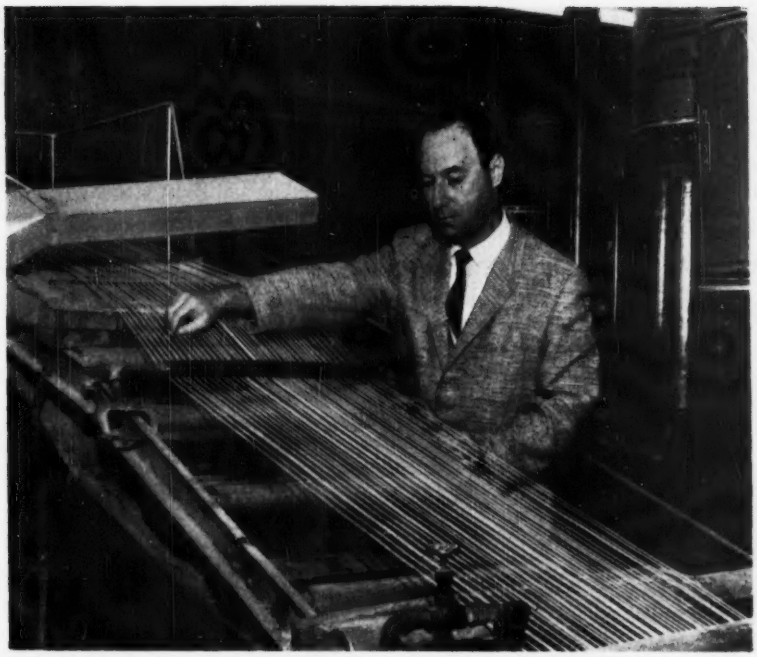
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PMI's Gould: From offbeat plastics he's extruded $7 million in sales.

Digging Deeper into Plastics

In the next few weeks bulldozers will begin clearing ground for a new polymerization plant and research lab at the (Hicksville, Long Island, N.Y.), site of Plastic Materials and Polymers, Inc. The 30,000 sq. ft. structure, adding 50% to PMI's Hicksville plant space, represents far more than a substantial expansion by one of the fastest growing firms in the business of plastics finishing.

It is a move in the direction of vertical integration; the company has never before maintained a polymerization operation.

Founded in the summer of '53 with a capitalization of $65,000, PMI has bounded from annual sales of around $600,000 (net income: $4000) at the end of '54's fiscal year to around $7 million in sales (net income: $250,000) today. And until now, this growth has been by services to the plastics industry, rather than plastics manufacture. But it is clear that moves toward manufacturing are logical steps in the firm's future.

Finding an Opening: The jobs on which the company built its success were largely those that were either too specialized or small to interest the large plastics producer. For example, a standard role for PMI is to buy such thermoplastics as cellulose acetate, polystyrene, polyethylene, acrylic and butyrate from basic producers, purchase colorants from dye and pigment producers and color and/or modify them to produce such special effects in resins as pearlescence, tinsel, and phosphorescence.

Besides coloring the plastics for sale to molders and extruders under PMI label (about 90% of the business) the company also colors plastic materials, on a fee basis, for several large plastic makers. In addition, PMI touches all bases by selling ready-to-use colorants to plastic manufacturers through a subsidiary operation, its Dry Colorants Division.

On the Move: Besides its expansion at the Long Island plant, PMI has recently put a number of new projects in the works. About five months ago the company put into operation a 26,000 sq. ft. plant in North Smithfield, R.I. Called Eastern Plastic Materials Inc., this installation is owned 80% by PMI and 20% by its EPM's manager, Kenneth Roberts, a former PMI sales executive. All the work, except for the modification of colorants, done at the Hicksville plant is duplicated at this new $300,000 plant.

Another operation, Dimensional Pigments, Inc., went into full production about a month ago in Bayonne, N.J., in a 10,000 sq. ft. plant once used as an experimental unit by Lummus Co. This subsidiary, owned 50% by PMI and 50% by its two plant managers, is in the business of turning out materials used to give plastics a pearlescent effect.

Dimensional's operation has faced some problems: there have been a number of hassles with the two other pearlescent plastics makers, Rona Labs and Mearl Corp., about whether or not Dimensional was entitled to use the processes it employs.

Not actually a part of PMI's corporate setup—but not to be overlooked as a possibility for some sort of future tie up—is a Chicago operation Thermo Plastic Materials and Thermo Plastic Processors Inc. It has essentially the same role in plastics as has PMI, and the majority of this company's stock is held by the officers of PMI.

Young Ideas: Most of the top management men at PMI are in their thirties. George Gould, company president is 36; Louis Kogan, secretary, is 38; Fred Barlow, sales manager, is 31; and Walter Glaws, technical director, is 36. The graybeard of the managerial group is Benjamin Kretkowski, vice-president, who's 50.

As might be suspected, the company got its start when a number of workers at one company—in this case American Molding Powder and Chemical Co. (Brooklyn)—decided they could do better running their own company. The first president of their enterprise, started in '53, was Herbert Preiss. After his death in an auto accident, George Gould took over the top spot.

The prime markets for PMI today are plastic molders and extruders in the toy, packaging, and costume jewelry field. These fields are the ones most constantly on the alert for new and novel ideas. PMI has cashed in on this, is now top supplier of plastic

for blow-molded doll bodies as well as for plastic jewelry. In the near future, the company may get into another field; it's presently working with a soft drink manufacturer on linear polyethylene for blow molded bottles which incorporate the scent of the flavor soda they'll contain.

Building Backward: Any shift in the company's operation in the future, according to company president Gould, will be in the direction of basic manufacturing. The new polymerization plant is an example of this. However, processing isn't completely foreign to PMI present capabilities. PMI is fairly basic in cellulose acetate, having picked up the business once handled in this material by Hercules Powder. Though relatively small, PMI can nonetheless claim to be the third largest processor of cellulose acetate in the U.S. (after Eastman and Celanese).

Currently both the Hicksville plant (which handles 1½ million lbs. of material/month) and the one in Rhode Island (which handles 1 million lbs./month) are operating on seven day week, round-the-clock schedules. Based on this, President Gould predicts that the seven-year old company, will see sales in the neighborhood of $9 million for the '61 fiscal year.

Active Surfactants

U.S. production and sales of surfactants in '59 climbed 10.2% over the '58 mark. The proof lies in latest figures from the U.S. Tariff Commission report which show that 1.5 billion lbs. of surface active agents were produced last year. Sales amounted to 1.4 billion lbs. and the dollar value added up to $268 million.

Anionics made up the biggest share —71%—of total production of surfactants. Last year 1 million lbs. worth $165 million were sold. Production of nonionic materials totaled 399 million lbs. valued at $86 million. The combined output of amphoteric and cationic agents in '59 were 35 million lbs. Some $17-million worth of these materials were sold.

The Tariff Commission said sales of cyclic surfactants in '59 were about 895 million lbs. valued at $139 million. About $125 million worth were sold in '58. Dodecylbenzenesulfonic acid products were the most important segment of the cyclic class.

Output of acyclic surfactants amounted to 558 million lbs., about 10% more than in '58. These sold at a $129 million clip. Sulfated and sulfonated acyclic compounds accounted for more than half of last year's production, and alcohols and esters were the biggest individual products in this group.

PRODUCTS

Metal Reconditioners: The Kane Chemical Co. (Ambler, Pa.) has developed three new metal treatment formulations: K 7-11 Rust Remover; K 7-11 Copper and Brass Cleaner; and K 7-11 White Rust Remover (for eliminating water marks on galvanized steel). The first two products are available in sizes ranging from one half pint to 30 gal. White Rust Remover comes in 5, 15, and 30 gal. drums.

•

High-Temperature Lubricant: A high-temperature lubricant has been developed by Metal & Thermit Corp. (100 Park Ave., N.Y.) Suggested for applications where thermal stability in 500-700 F range is required. The lubricant, diphenylbis-n-dodecylsilane, is said to have excellent oxidation-corrosion stability.

•

Carbon Black Dispersions: Columbian Carbon (New York) has introduced a new series of dispersions of carbon blacks in either butyl alcohol or isopropyl alcohol. They're marketed under the designation Alcoblaks.

•

Impregnated Polishing Cloths: Speedry Chemical Products (P. O. Box 97, Richmond Hill, Jamaica, N.Y.) has brought out a line of seven polishing cloths impregnated with detergents, waxes and other ingredients. The seven varieties include cloths for silver and brass polishing, windshield antifogging, furniture polishing, clothes pressing, phonograph wiping, and general dusting. The retail price will run 49¢ and 69¢ cloth.

•

Concrete Densifier: Horn Research Laboratories, division of Sun Chemical (New York), has developed a compound in powder form which controls, sets and reduces water content (without increasing air content) in concrete and mortar mixes. It's called Symentard, is used at the rate of ½-1 lb./50-lb. bag of cement.

•

Aerosol Container: Emson Research, Inc. (118 Burr Court, Bridgeport, Conn.) is marketing a 13.5-cc. aerosol container with a metered valve. The unit has a stainless steel inner container, anodized aluminum outer container. It's said to be competitively priced with 10-cc. units now on the market while offering 100 to 125 more "shots."

•

Flexible Epoxy Resins: Epoxy resins, said to give increased flexibility to conventional epoxy systems, are now being offered by Dow Chemical under the designations X-2673.2, X-2673.6 and X-2674. The resins, light-colored, low-viscosity fluids, may be blended with common liquid and solid epoxies, are cured with all common hardeners. Use of the resins is said to increase flexure strength of epoxy systems from 25-40%.

•

Cleaner-Phosphatizer: A phosphating compound for simultaneous cleaning and phosphating of iron, steel and zinc is being marketed by Turco Products (24600 South Main St., Wilmington, Calif.) under the name Paintite.

•

Blasting Agent: Du Pont is now marketing a pre-mixed blasting agent under the tradename Nilite 101. The nitro-carbo-nitrate blasting agent can be used in holes as small as 2 inches in diameter, is sold in 50-lb. bags (Price: $6.75/100 lbs).

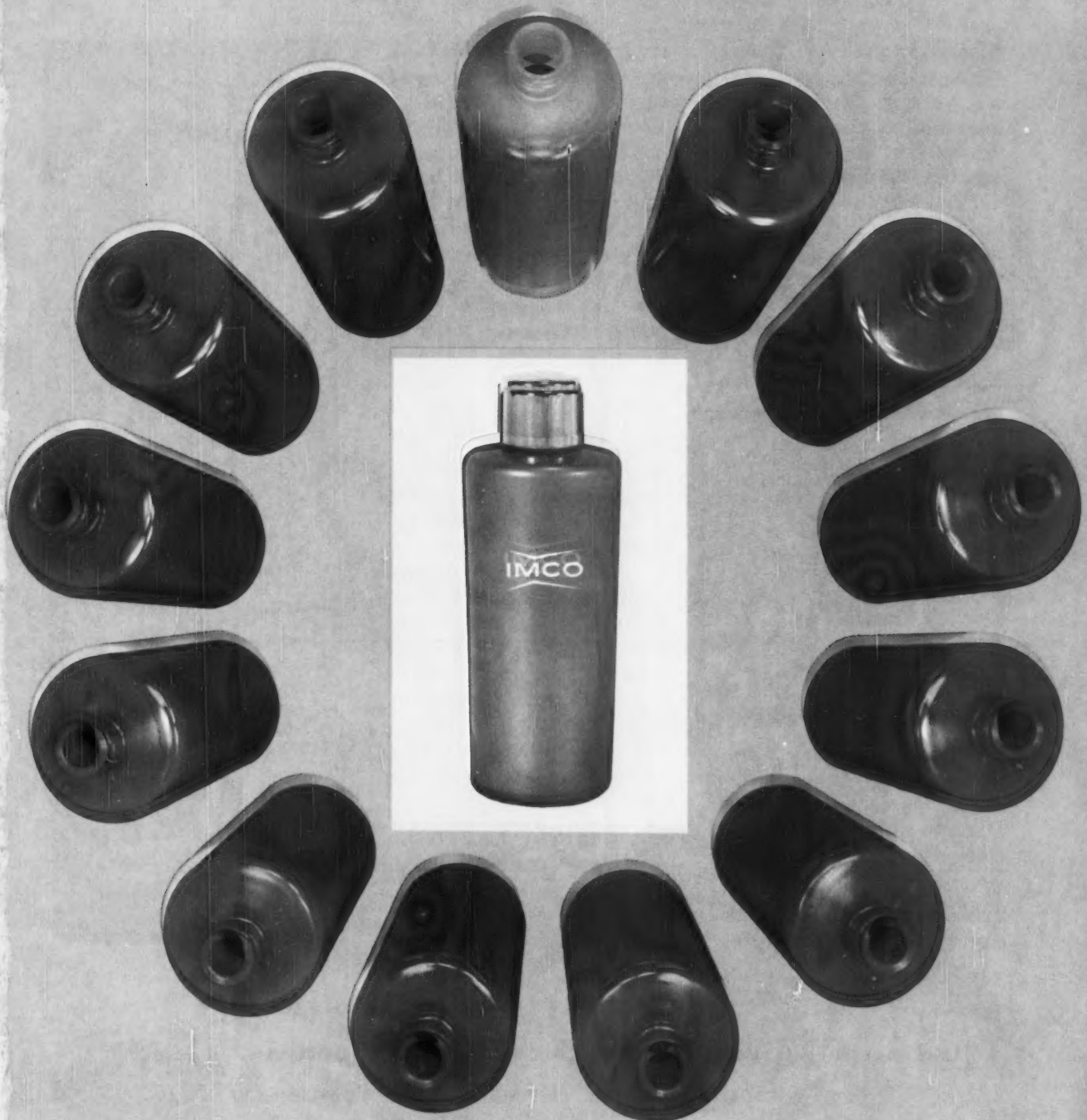
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Teflon Tape for Treads: A line of teflon tapes for dry-sealing all types of threaded pipe joints and cable connectors is being offered by Hi-temp Wires Inc. (1200 Shames Drive, Westbury, N.Y.). They're sold under the tradename Wrap-it, come in lengths of 25, 50 and 75 yds., in ½-in. widths and 10 colors.

•

Textile Softener: Atlas G-3573, a cationic textile softener for natural and synthetic fibers, is now being marketed by Atlas Powder Co. (Wilmington, Del.). Atlas says it is easily formulated by the textile chemical compounder as a 25% active fluid dispersion.

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. . . WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY

Technology
Newsletter

CHEMICAL WEEK
July 30, 1960

Two developments in atomic fuel elements this week:

• Low-cost nuclear fuels that will sharply cut cost of electricity from reactor-powered generators are predicted by Battelle Memorial Institute's Russell Dayton. One such fuel element now being studied is made by simply filling a metal tube with powdered uranium oxide and sealing it. According to Dayton, the new element is much cheaper to prepare than present fuel elements that require pressing, high-temperature sintering, and grinding of uranium oxide pellets before they are loaded in the tube and sealed. Oxides and carbides of uranium, thorium, and plutonium are top contenders for duties as future low-cost fuels, says Dayton.

• Enriched uranium-beryllium oxide will be used in fuel elements for Tory/Two/C, Project Pluto test reactor designed to demonstrate feasibility of nuclear ramjet propulsion. Coors Porcelain Co. (Golden, Colo.) will fabricate the fuel elements under a new contract with University of California's Lawrence Radiation Laboratory, which operates Livermore Laboratories (where the test reactor was designed) for the Atomic Energy Commission. Proposed use of a nuclear ramjet is in a supersonic low-altitude missile.

•

More light was shed this week on Kennecott Copper's process for commercial production of pure rhenium (*CW Technology Newsletter, March 7, '59*) in U.S. Patent 2,945,743. Contaminated dilute rhenium-bearing solutions are made basic, passed through a column of anionic resin. After the resin is saturated with rhenium, it's washed with water, and the rhenium extracted with strong, highly ionized mineral acid. Rhenium is precipitated from the acid solution as a 99.99% pure product, and the resin recycled. Rhenium melts at 5700 F, has tensile strength of 80,000 psi., will be used commercially for electronic filaments and special high-temperature alloys.

•

The aldehyde intermediate in Ajinomoto's monosodium glutamate synthesis (*CW Technology Newsletter, April 16*) β-cyanopropionaldehyde, according to British Patent 828,946. This aldehyde, made from acrylonitrile by a tricky oxo reaction, is then reacted in aqueous solution with hydrogen cyanide and ammonia to form an aminonitrile, which is then hydrolyzed into racemic glutamic acid. Extraction of the *levo* form of the sodium salt gives MSG. At least one firm in this country is known to be considering research on the β-cyanopropionaldehyde route, but with a different starting material.

•

A fully continuous process for acrylic fiber polymerization and spinning, reportedly a low-cost route, has been developed by Von Kohorn International Corp. (White Plains, N.Y.). John Rieck, vice-president of the firm's Synthetic Fiber Division, says the process is "a new approach to acrylonitrile polymerizaiton that winds up directly with the spinning solu-

tion." The process was developed in Von Kohorn's experimental plant, is now being tested on a semicommercial scale.

Results so far show that fully automatic and continuous polymerization and dissolving prior to spinning reduce capital cost 70%; utility and labor costs are about 50% that of conventional processes. Production costs are lowered by "substantially increased yields in shorter reaction periods."

Indications are that Von Kohorn's approach involves a new catalyst. One of the problems with conventional processes is in removal of the catalyst from the acrylonitrile. Washing is required to remove catalyst and unpolymerized material from the spinning mix to prevent such problems as lower tensile strength, softening point and dyeability of the fiber. A number of companies have been trying to polymerize in a spinning solvent. But, according to Von Kohorn, this would eliminate only one process step, wouldn't permit a continuous process.

The company has applied for patents in the U.S. and in a number of foreign countries. The issue of patents in one foreign country is "imminent." Von Kohorn plans to follow the pattern of its viscose rayon process development, offer the new acrylic process to clients for whom it would build plants. Licensing of others may follow.

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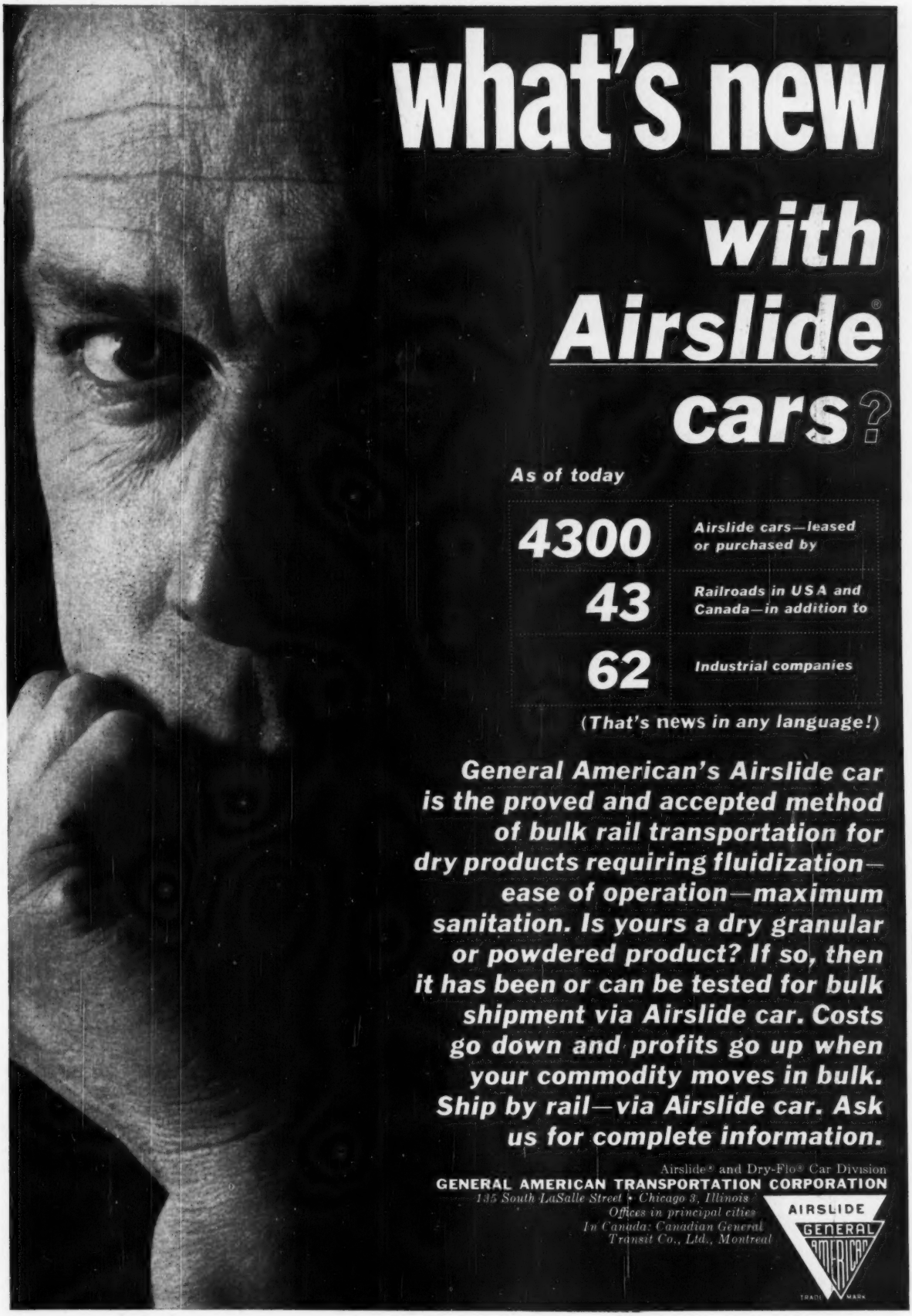
B. F. Goodrich Chemical's mysterious 'polyvinyl dichloride" composition of the firm's new Hi-Temp Geon Resin for use at 180 F (*CW Technology Newsletter, May 21*) may be chlorinated polyvinyl chloride, according to Australian patent application 52,593/59. The company won't comment on the patent, says it's waiting for issuance of U.S. patents. So far, all that Goodrich has said is that the material is not polyvinylidene chloride and that the coined name is not a misnomer; "There's an extra chlorine atom in there," says one company spokesman. The other conceivable possibilities—polymerized ethylene dichloride and highly chlorinated polyethylene—appear to be less likely than chlorinated polyvinyl chloride, especially in light of the new patent information.

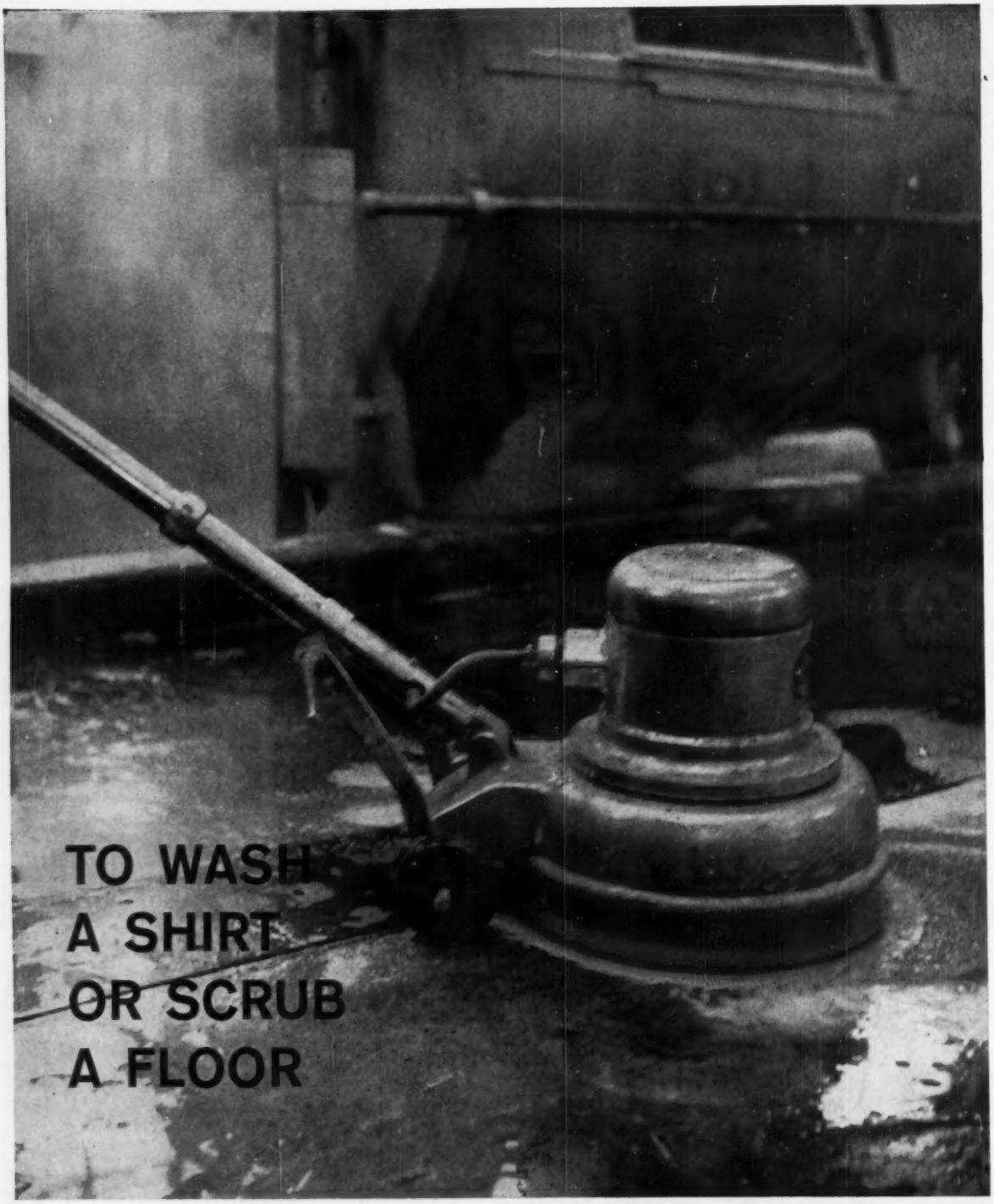
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First commercial plant utilizing a new water treating process is in use this week by the city of Waterford, N.Y. (near Albany). Key to the process is continuous control of the electrokinetic charge (zeta potential) carried on colloidal particles, which must be neutralized before the particles will coagulate and precipitate. The charge can be rapidly measured with a special cell developed by Riddick Associates (New York City). Proper amounts of anionic and cationic polyelectrolytes are then added and the colloids readily settled out.

•

Diammonium phosphate fertilizer can be made by a new TVA process that uses low-cost, wet-process phosphoric acid, eliminates the purification step common to older processes. Grade of the product depends on purity of the phosphoric acid available, ranges up to 21-53-0 (nitrogen-phosphorus-potash) when electric furnace acid is used.


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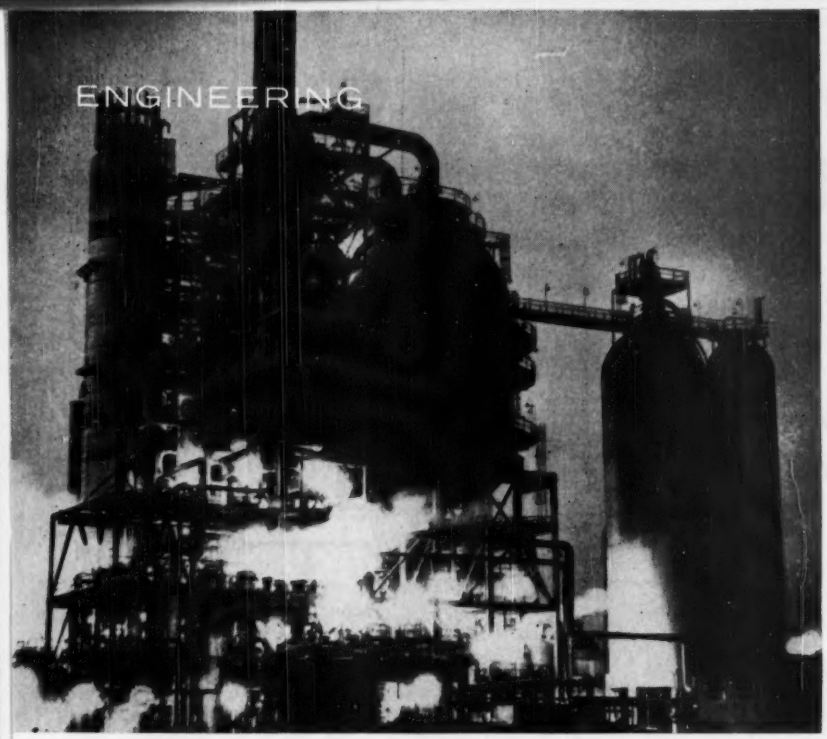
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Esso's FCC unit at Bayway is typical of crackers posing . . .

New Catalyst Challenge

Changing petroleum markets are forcing catalyst makers to develop new fluid-cracking catalysts that can provide high flexibility of yields from cat-cracking units like the one shown above. Because of the highly competitive nature of the fluid-cracking catalyst (FCC) business — which is estimated at $44 million/year — it's understandable why catalyst producers are striving to come up with new products to meet the shifting needs of refiners.

Underscoring the ferment in the catalyst industry this week are three developments:

- Nalco Chemical Co. (Chicago) is introducing two new catalysts—a silica-magnesia product and a silica-magnesia-alumina material. Although neither one is now being tested commercially, arrangements for such tests are expected to be completed shortly.
- Davison Chemical Division of W. R. Grace & Co. has reached an agreement for commercial testing of its silica-magnesia catalyst, called Davison SM-30, at an undisclosed refinery location. This catalyst appeared on the market last month (*CW Technology Newsletter, June 18*).
- Shell Oil is testing American Cyanamid's new silica-magnesia-alumina catalyst, Aerocat 3C-12, at its Shelburn refinery, near Vancouver, B.C. The new Cyanamid catalyst debuted on March 30.

The new types of catalysts stem from demand for catalysts tailored to needs of the many products refiners are called upon to produce. Davison's F. Emerson Ivy defined the trend at a recent meeting of the Western Petroleum Refiners Assn. in Wichita, Kansas, when he said, "It is apparent that no one or two types of catalyst can completely satisfy the different requirements which now exist within the petroleum industry."

Here are the four types of synthetic catalysts now available to refiners:

Pure Synthetics: powdered spheroids in which alumina is impregnated into a synthetic dry gel of silica. Normally available in two qualities, 13% or 25% alumina with the remainder silica, they are 2-3 times more expensive than natural catalysts, are used in about 70% of the FCC units because of their greater thermal stability and superior catalytic properties. They produce large yields of high octane gasolines, together with light cycle oil, isobutane, propylene, butylene, off-gas and coke.

Synthetic-Natural: silica-alumina catalysts in which a large percentage of the synthetic silica is replaced by natural clays, thus reducing raw materials costs. They were introduced about two years ago, include such products as Filtrol 100, Davison SS, Nalco 783, Cyanamid's Aerocat 2000.

Manufacturers are careful to distinguish between the synthetic-natural materials in which the silica and alumina are deposited on the clay from those in which the two materials are introduced into the clay. The latter type normally contains the same relative percentages of silica and alumina as the pure synthetic silica-alumina. Principal advantage of the synthetic-naturals is lower cost with equivalent thermal stability.

These synthetic natural catalysts sell at about $240/ton, compared with $315-355 for pure synthetics. They've found a market, with a reported 20 out of the nation's 126 FCC units now using semi-synthetics.

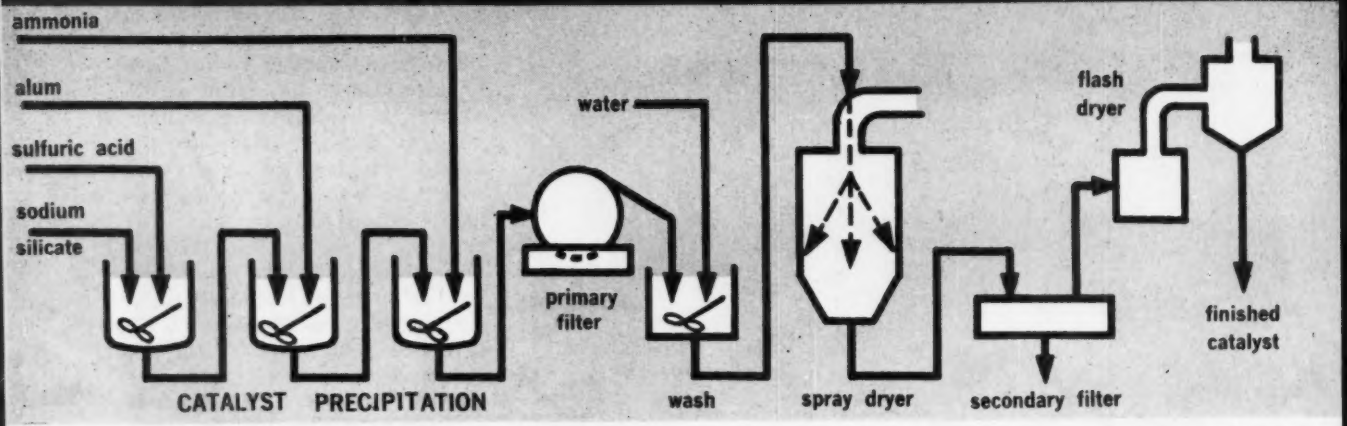
Silica-Magnesia: synthetic silica spheroids impregnated with magnesia to give an overall composition of 12-25% magnesium oxide in silica. In the past, principal disadvantage has been poor regenerability. These catalysts give very large increases in gasoline and light oil, and lower yields of coke and off-gas. Newer catalysts have improved regenerability.

Silica-Magnesia-Alumina: 3% magnesia and 12-20% alumina impregnated into synthetic silica. These catalysts, the newest of the group, give increased yields of gasoline (with same octane), propylene and buty-

FCC catalysts are a fine powder, must flow like the one shown here.



Precipitation: Key to Multiproduct Catalyst Process



lene, while decreasing the yields of dry gas and coke.

The Catalyst Types: Any FCC catalyst must be: (1) spheroidal and free-flowing; (2) resistant to attrition; (3) resistant to thermal shock; (4) resistant to corrosion by compounds such as sulfur and naphthenic acids contained in the oil. Resistance to thermal shock is the most important.

Catalyst properties, as well as type, are obtained by close control of the manufacturing process (*see flow sheet, above*). Essentially the same equipment is used for all products. Since all manufacturers have processing patents that are not yet cleared, process details are held secret. However, six typical steps used to manufacture pure synthetics are: (1) sand is reacted with soda ash to make sodium silicate; (2) silica gel is precipitated from the sodium silicate with sulfuric acid; (3) alumina trihydrate is made by reacting bauxite with caustic soda in the Bayer process; (3) alumina trihydrate is converted to alum (aluminum sulfate) by reacting it with sulfuric acid; (5) the precipitated silica gel is impregnated with soluble alum; (6) the impregnated silica gel is precipitated by neutralizing with aqueous ammonia.

Physical treatments following this are: primary filtration, water wash, spray drying, secondary filtration, and flash drying, after which the powdered catalyst is collected by cyclones.

Heart of Process: The fluid catalytic cracking (FCC) units—target of these catalysts—are the heart of most model petroleum-petrochemical manufacturing complexes. They handle about 90% of this country's catalytically cracked gas oil (4.1 million bbls./day). The other 10% is cracked in thermofor catalytic crackers, which use bead catalysts. Products from FCC units are typically: propane and lighter (6.0-10.0%), butanes (3.0-11.0%), butylenes (5.0-8.0%), gasoline (35-55%), heavy gas oil (2.0-12.0%) and coke (4.0-4.5%).

Fluid cracking catalysts represent a big market. FCC units consume 0.20-0.28 lbs. of catalyst per barrel of charge. This amounts to a total daily U.S. consumption of 400-500 tons. Total annual sales range from $30-55 million, with $44 million/-year accepted as good average.

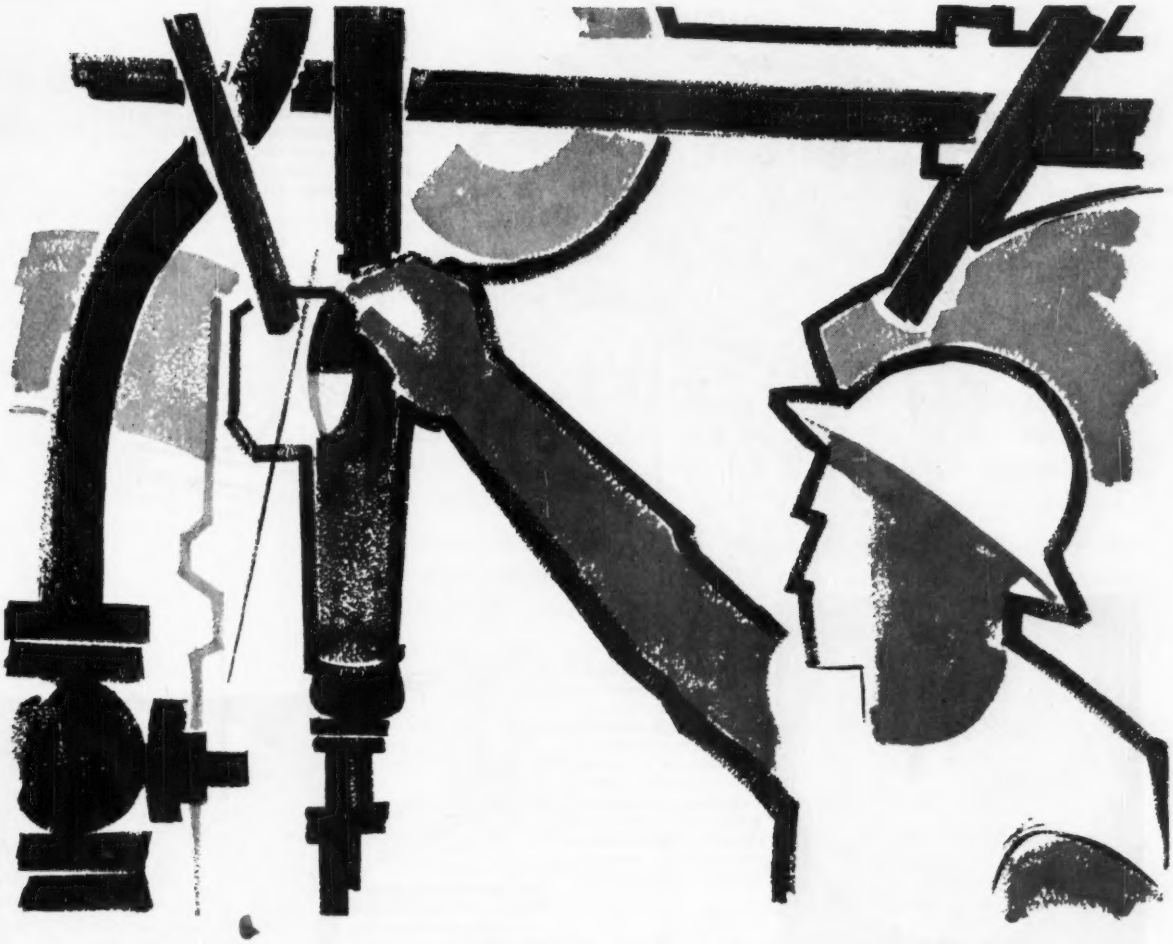
Catalyst cost to the refiner runs about 10¢/bbl., or about 5% of the overall cost of up-grading gas oil. An oil industry expert says that a large refinery, with well integrated auxiliary processes, will feed its FCC unit with gas oil valued at $3.50/bbl., while the value of its products will be about $4.80/bbl. Processing costs (including catalyst) chew up about $1.00 of the differential between these two figures, leaving a margin of 30¢/bbl.

Changing Markets: The change in modern petroleum markets is the reason for the push toward new types of synthetics. In general, FCC operators balance gasoline production against fuel oil and light end cuts such as propylene and butylene. In the West, where the demand for low-vapor-pressure gasoline is relatively high compared with that for fuel oil, refiners prefer gasoline. But in the East—especially during peak winter demands—they tend to favor fuel oil. If a particular refinery complex has units taking large feeds of propylene or butylene for petrochemicals, they favor these.

When the semi-synthetics came along in 1958, they exhibited oil-cracking properties somewhat similar to those of pure synthetic, but with lower bulk catalyst cost. At this point the refiners had three types of catalyst to play with: natural, pure synthetic and semi-synthetic. By changing the catalyst type fed into their FCC units as make-up, they could limit variation in product distribution. (Catalyst in a fluid cracker is always changed by changing the type of make-up. The capacity of the giant units—up to 70,000 tons valued at $250,000 — prohibits immediate changeover.)

Thus catalyst manufacturers are faced with demands for a broader line in a market whose total volume follows the over-all demand for petroleum products. They are responding with the silica-magnesia and silica-magnesia-alumina types of synthetic catalysts.

Although each of the new catalysts is thoroughly pilot plant-tested before it's offered for sale, all catalyst makers agree that the only sure test is in commercial operation. As a result, there's usually a 1-2-year lag between the time laboratory product becomes available and its commercial acceptance. In the meantime, since all catalyst makers declare they're pushing research on newer types, refiners can continue to look for catalysts that will favor the production of a single given product.



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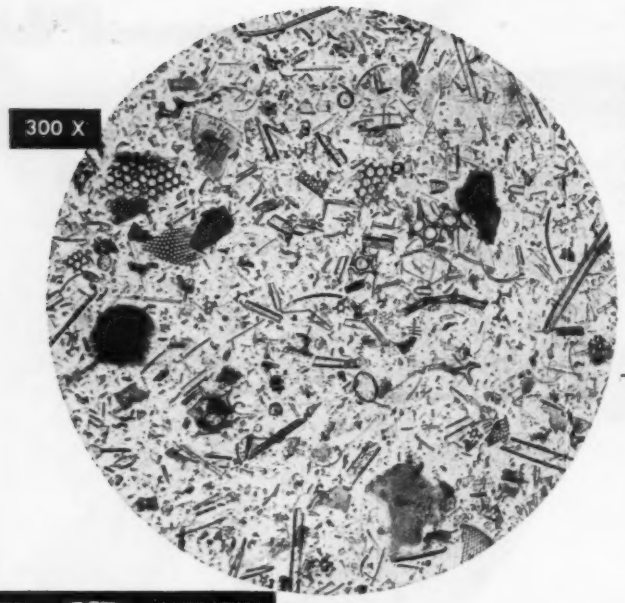
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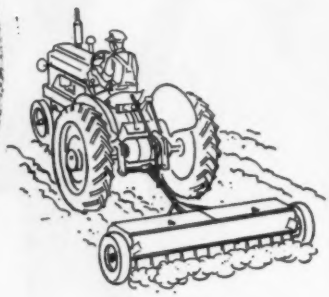
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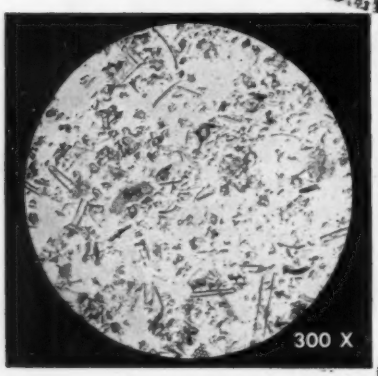
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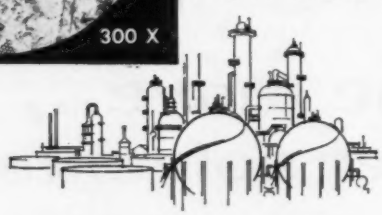


For fertilizer coating—Celite 379, a natural milled diatomite, provides the uniform conditioning needed to prevent caking of granular, mixed or prilled fertilizers—maintains good free-flow characteristics even after prolonged storage.



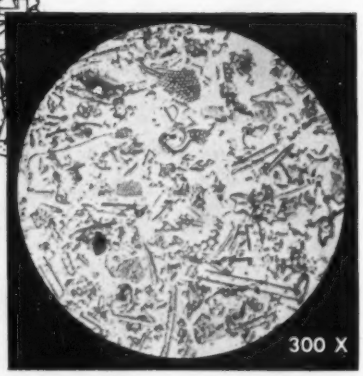


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Market Newsletter

CHEMICAL WEEK
July 30, 1960

Look for word of a sharp hike in ammonia prices on the West Coast next week. Collier Carbon and Chemical Co. is expected to increase tabs to $92/ton f.o.b. plant, effective Oct. 1, an increase of $26/ton over the current price of $66/ton.

An attempt by Hercules to increase the prices of its West Coast ammonia will go into effect next week. Effective Aug. 1, Hercules tabs will be $72/ton, with another increase, to $75/ton, scheduled for Oct. 1 (*CW Market Newsletter, May 28*). It's uncertain what effect the Collier move will have on Hercules'—as well as other Western ammonia producers'—pricing policies.

Dissatisfaction with the present ammonia price schedule in the West stems from the $66/ton tab that went into effect in '58. Ammonia prices east of the Rockies are $88/ton.

Concentrated superphosphate capacity has been tripled at the Nichols, Fla., plant of Virginia-Carolina Chemical Corp. The new unit, part of a $10-million expansion, will boost output potential from 100,000 to 300,000 tons/year.

A diammonium phosphate operation is also included in the expansion plans, will probably be completed by next Dec. 1. Potential capacity will be 100,000 tons/year. Some of the concentrated "super" from the new plant, will go into diammonium phosphate.

Twenty miles away, at the firm's Clear Springs mine, a third project is nearing completion. A new phosphate rock flotation operation, costing more than $1 million, is expected to be completed within another month or two.

•

The dismal tar output picture in '59, due to the steel strike, was reflected in lower production of coal-tar chemical, despite one published report to the contrary. U.S. production of all tars in '59, according to last week's Tariff Commission preliminary report, was 4% lower than output in recession-ridden '58, totaled 669 million gal. To the chemical industry this meant a further drop in production of benzene, toluene and xylene from this source. However, production of these chemicals by petroleum producers increased sharply. Net result: total output of BTX chemicals last year gained over '58 production.

Naphthalene output from coal tars was up in '59, but short of demand.

•

Great Britain is a booming market for U.S. chemicals—to the chagrin of the British government. During the first five months of this year, U.S. chemical exports to the U.K. rose to $58 million, compared with $33.3 million in the corresponding '59 period. Exports of synthetic fibers, yarns, and woven fabrics soared from $837,500 to $5.6 million. What worries the British is that their own exports have been slacking off,

leaving them with the worst trade gap in a number of years. The solution, Prime Minister Macmillan has told British manufacturers, is to sell harder abroad.

British chemical sales, to Japan at least, will be rising as the result of a new trade pact between the two countries. It allows for more British exports of industrial catalysts, paints and varnishes.

•

Japanese styrene-butadiene rubber prices were cut $5/ton last week by Japan Synthetic Rubber. New tabs, which went into effect immediately, are $550/ton, and further reductions appear likely. Reason for the cuts: imports arriving in the Kansai area are selling at $530/ton.

Meanwhile, Japan Synthetic Rubber's new Yokkaichi plant, which started operations last April, is now turning out 3,600 tons/month. Production target for the year is 35,000 tons.

•

Commercial quantities of columbium and tantalum pentachloride are now being offered by Stauffer Chemical from its Richmond, Calif., plant. Simultaneously, the company put a new price schedule into effect for the two compounds. Spot quotes, f. o. b. Richmond, Calif., are $10/lb., for tantalum pentachloride, 2,000-lb. lots and over. Columbium pentachloride prices are $5/lb. on the same basis. Lower prices are quoted for larger quantities on an annual contract.

Stauffer's commercial plant has been operating at full capacity the past six to eight weeks. Output will be sufficient, says Stauffer, to take care of anticipated requirements over the near future. Major use for the pentachlorides is in production of the metals, both of which reached record highs in '59. Tantalum output was an estimated 124 tons. Columbium metal production statistics are not available, but output was reported to be double '58's level, according to the Bureau of Mines.

•

Offers for 1.1 million lbs. of tungsten carbide are being requested by U. S. Department of Agriculture in exchange for agricultural products in the Commodity Credit Corporation inventory. Under the barter program, crude tungsten concentrates must originate in friendly foreign countries, with final processing into the tungsten carbide powder to be done in the U. S. The powder will be transferred into the Supplemental Stockpile, authorized by the Agricultural Trade Development and Assistance Act of '54.

Delivery of tungsten carbide must be made within 22 months from the date of barter commitments, while exports of the bartered agricultural commodities must be completed within 24 months. Currently the agricultural products available in the CCC inventory for barter include nonfat dry milk, butter, cotton, tobacco, rice, wheat, corn, barley, rye and grain sorghums. All offers must be received by the Barter and Stockpiling Division, CSS, USDA, by 3 p. m. (EST) Friday, Aug. 5.



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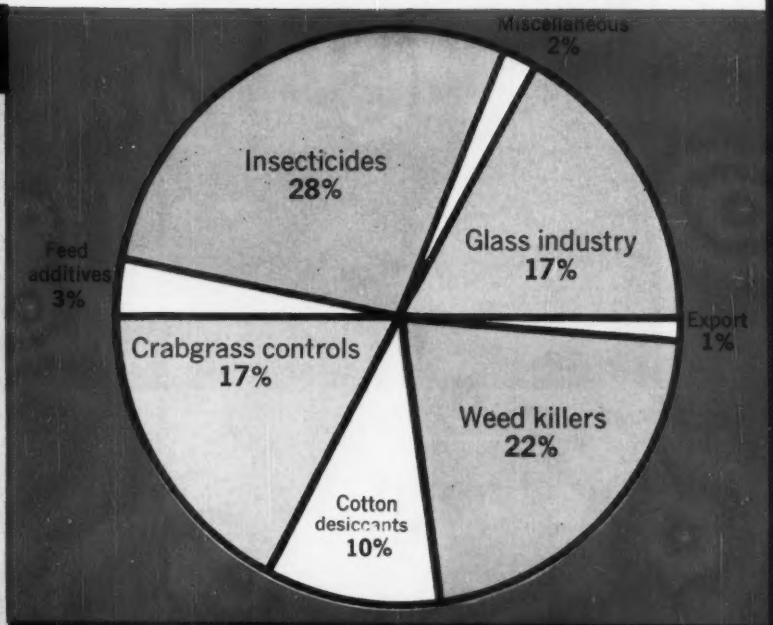
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White Arsenic Supply in '59
(short tons)

U.S.	ASARCO (Tacoma, Wash.)	4,000
	Anaconda (Anaconda, Mont.)	1,000
Mexico	ASARCO (San Luis Potosi)	10,500
	AMC (Torreon)	2,000
France		3,500
Sweden	Boliden (Boliden)	2,750
Canada	Deloro (Deloro, Ont.)	600
		24,350
	Estimated U.S. producer's stock consumed in '59	4,000
	Total U.S. consumption	28,350



Where arsenic went in '59

Herbicides Take Bigger Bite of Arsenic Pie

Briskly rising sales are currently sweetening the outlook for domestic arsenic producers. On the heels of a 30% consumption upswing over '58 (the highest usage since '51), an additional 8-10% increase is in store for this year. A relatively new use for arsenicals—crabgrass control — is primarily responsible for the sales increase, and its impact on the market illustrates the one glum spot in the arsenic picture: the need for new outlets.

For the first six months of '60 arsenic demands are holding up well, and '60's consumption of crude and refined arsenic will likely top the '59 consumption of more than 28,000 tons by 2,000-3,000 tons. With copper production back at quick tempo, however, arsenic stockpiles will undoubtedly stack up until significant new outlets and applications are developed.

Consumers, of course, are enjoying the ready availability of the metal; almost forgotten is last year's five-month copper strike that dropped U.S. arsenic production by 50% to a reported 5,189 tons—the lowest figure in 55 years. Helping lessen the impact of that strike: imports that doubled to fill the gap that could have been painful to consumers, since arsenic demand was rising.

Arsenic crabgrass chemicals, for example, have expanded rapidly from only a few hundred tons in the early '50s to 5,000 tons last year. Predictions for '60 are for a market of over 5,000 tons—about 20% of the total arsenic picture. Primary marketer of organic arsenicals for controlling crabgrass: Vineland Chemicals, Vineland, N. J.

Burgeoning By-product: Arsenic is a by-product of smelting complex ores of copper, lead, gold and silver. It is actually recovered as arsenic trioxide (white arsenic) and marketed either as crude (95-98%) or refined (over 99%) material. Only refined, which occupies a 55% cut of the overall market, is imported.

Largest individual producer is American Smelting and Refining Co. with copper smelters at Tacoma, Wash., and San Luis Potosi, Mexico. Last year Asarco shipped more than half of the 19,386 tons of arsenic imported into the U. S. With an additional 4,000-ton output from its Tacoma smelter, Asarco kept its fingers on 70% of the arsenic in domestic consumption.

Anaconda is the only other arsenic producer in the continental U. S. In '59 it supplied only about 1,000 tons from its copper smelter in Anaconda, Mont. U. S. Smelting, Refining and Mining Co. (Midvale, Utah) formerly marketed a small amount, but it has since ceased arsenic operations.

Market for Killers: Insecticides remain the biggest arsenic end use, although consumption over the past 15-20 years has been tumbling steadily downward. Even though the arsenic share of the insecticide market has been gradually undermined by DDT and other chlorinated hydrocarbons introduced during the '40s, manufacture of calcium and lead arsenate still demands some 8,000 tons of arsenic/year. After holding 60-70% of the arsenic market in prewar years, insecticides decreased

to about 40% by '53 and now account for less than 30% of U. S. consumption.

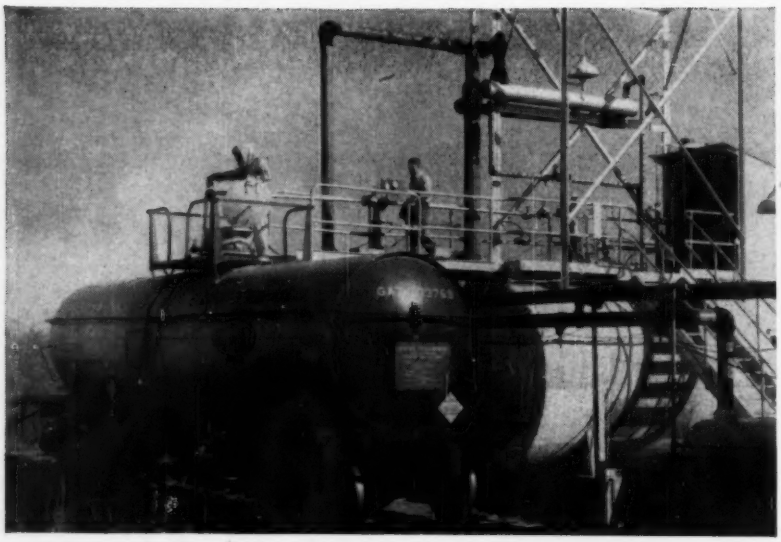
Future needs will likely keep this present figure from dropping much more since calcium arsenate is necessary for combating the boll weevil when the weevil becomes periodically immune to organic insecticides. Result: calcium arsenate demand fluctuates considerably from year to year depending solely upon the factors affecting the boll weevil.

Lead arsenate still finds many outlets in the poison sprays and dusts used for pests on vegetable and fruit crops. In '59, U.S. chemical industries exported 700 tons of lead arsenate and a small amount of calcium arsenate. Ten years ago this picture was completely reversed with calcium arsenate leaving the country at the rate of several thousand tons/year, and very little lead arsenate being exported.

More uses of arsenic for weed and turf control have helped to move arsenic-based weedkillers up slightly to a 5,000 ton/year outlet for the metal. Sodium arsenite has proven to be cheap and effective in weed control and has made recent gains. Arsenicals are also important now for aquatic weed control. Crabgrass control (generally dry applications) constitutes still another outlet; all told, weedkillers require some 35-40% of the arsenic used in the U. S.

Growth with Glass: Growing with the expanding glass industry, demand for a granular arsenic product has nearly doubled in the last 15 years. Glassmakers have long required arsenic as a decolorizer and refining agent in glass manufacture. Now this use consumes 17% of all arsenic sold annually. Asarco is the only producer offering a coarse, dustless grade of arsenic for glass manufacture.

The relatively new (4-5 years old) use of arsenic acid as a cotton desiccant (to dry up the leaves on cotton plants so that mechanical pickers can do more efficient jobs) last year accounted for 2,500 tons of arsenic. Presently, however, the Food and Drug Administration has halted this method of desiccation until further study can be made of arsenic residues in the cotton seed cake. If a waiver should be granted before the opening of the current cotton harvesting season, sale of arsenicals will remain



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QUALITY	SPECIFICATION	TYPICAL ANALYSES
HCN	99.5 min.	99.8%
Acidity (as H_2SO_4)	0.06% min. 0.10% max.	0.08%
Color	Not darker than APHA 20	Water white
H_2O	0.5% max.	0.12%

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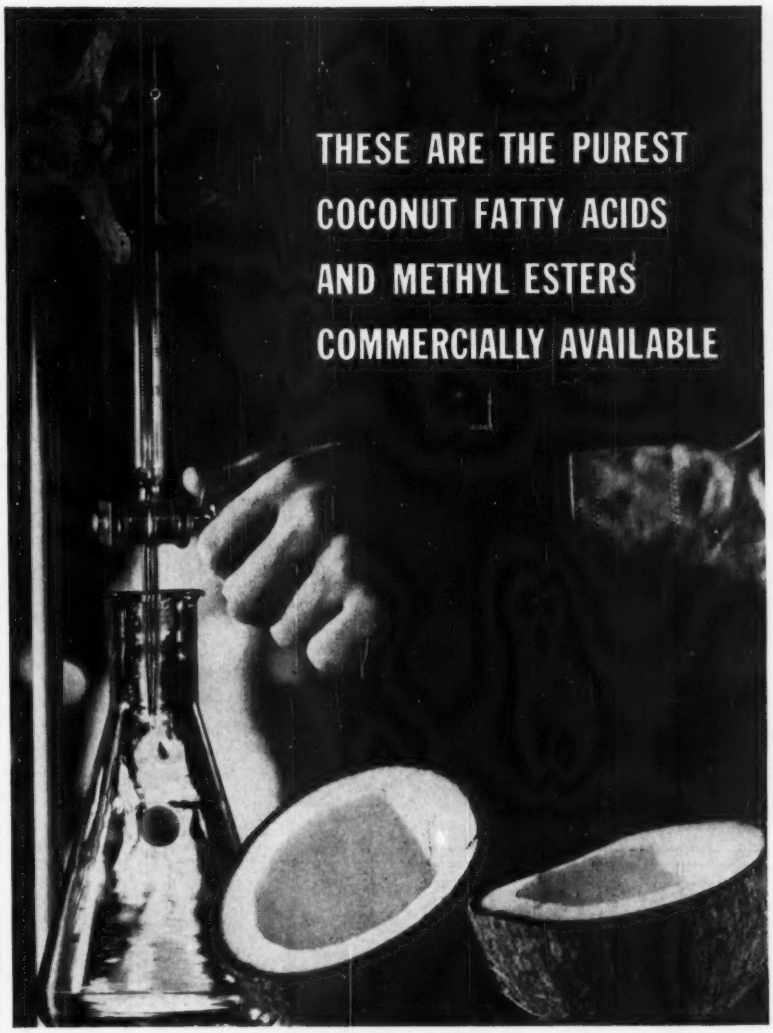
Arsenic's role in feed additives is barely 10 years old, serves as an outlet for about 3% of the arsenic consumed annually. It successfully stimulates growth and controls disease in poultry flocks, has been used to increase feed efficiency with swine. These compounds reportedly don't face competition from antibiotics, instead the two work hand-in-hand. This year some 500-1,000 tons of arsenic will be channeled into these additives. The FDA still has these organic arsenicals classified as suspect carcinogens, so no new developments in the field may be expected until all of the compounds are cleared by the FDA. This arsenic outlet is expected to remain steady.

Fastest Grower: The fastest growing phase of the arsenic market won't even register on an end-use breakdown chart: high-purity arsenic compounds. While the adaptation of arsenic metal and arsenic trioxide of purity greater than 99.999+% to electronic applications doesn't even begin to dent the arsenic market picture — and probably never will — volume has been upped ten-fold within the last two years. Consumption this year will approach five tons with more applications being realized every day.

Typical specialized uses: the tunnel diode (made by super-doping germanium with arsenic) and indium or gallium arsenide intermetallic compounds. Two producers—Asarco in its Plainfield, N. J., laboratory and Consolidated Mining and Smelting at Trail, British Columbia—are currently supplying this highly refined arsenic for research and electronic applications. Going price: $50/-100-gm. ampule of metallic arsenic.

Equally tiny quantities of arsenic yearly find countless applications and uses in the dye, paint and rubber industries. Likewise, it is still in demand for medicinal purposes, wood preservatives, poison baits, alloys, etc.

Local Advantage: Because of Asarco's two plant locations and relatively little domestic competition, it holds a distinct marketing advantage over European producers. It ships from the most convenient of four Western stations with little regard for which supply point it uses. By utilizing closed cement-type gondola cars, it is able to ship in bulk carload



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lots, pricing crude arsenic at $.026/-lb. f.o.b. Tacoma or Laredo. Barrel quotes f.o.b. same points are $.041/-lb. European exporters can ship only in hardwood barrels and can economically supply only Eastern and Gulf ports. European refined arsenic, however, undersells Asarco in New York, with tabs at about $.04/lb.; Asarco barrel quotes there are $.055.

Some 6,250 tons of refined white arsenic reached domestic consumers in '59 from Sweden and France, chief European suppliers. Sweden is the world's largest arsenic producer as a result of gold smelting operations involving ore which sometimes contains as much as 10% arsenic (copper ores smelted in North America are in the vicinity of 1% arsenic content). Presently at the Boliden mine in Sweden are huge quantities of crude arsenic, stored in silos and awaiting a market. Estimates place the volume of arsenic in storage at 400,000 tons. Since there is no tariff on white arsenic, U. S. prices are automatically held down by the enormous reserve in Sweden which would enter the U. S. market as soon as prices rose to cover freight costs.

The balance of the imported white arsenic last year came from American Metal Climax, Inc., Torreon, Mexico, and Deloro Smelting and Refining Co. at Deloro, Ontario, Canada. These two smelters account for only a few thousand tons/yr.

Metal Minor: No arsenic metal is normally produced by the U. S., and only 42 tons were imported last year. Consumption here seldom exceeds 100 tons and has almost no effect on the total arsenic picture. It finds its main use in metal alloys.

Research, in an effort to find more new outlets for growing stockpiles of arsenic, was shoved into high gear in '54-'55. A discernible shift in emphasis from agricultural applications to other, frequently diversified, uses is in the works. So far new applications have succeeded in buoying up the arsenic market sufficiently to at least balance the drag effected by lowered consumption by insecticides.

Much of this advancement which has clothed the arsenic industry is also helping it gradually to shed its ancient role as a hard-to-handle poison, in favor of a more creditable one as vital partner of farmer and manufacturer.



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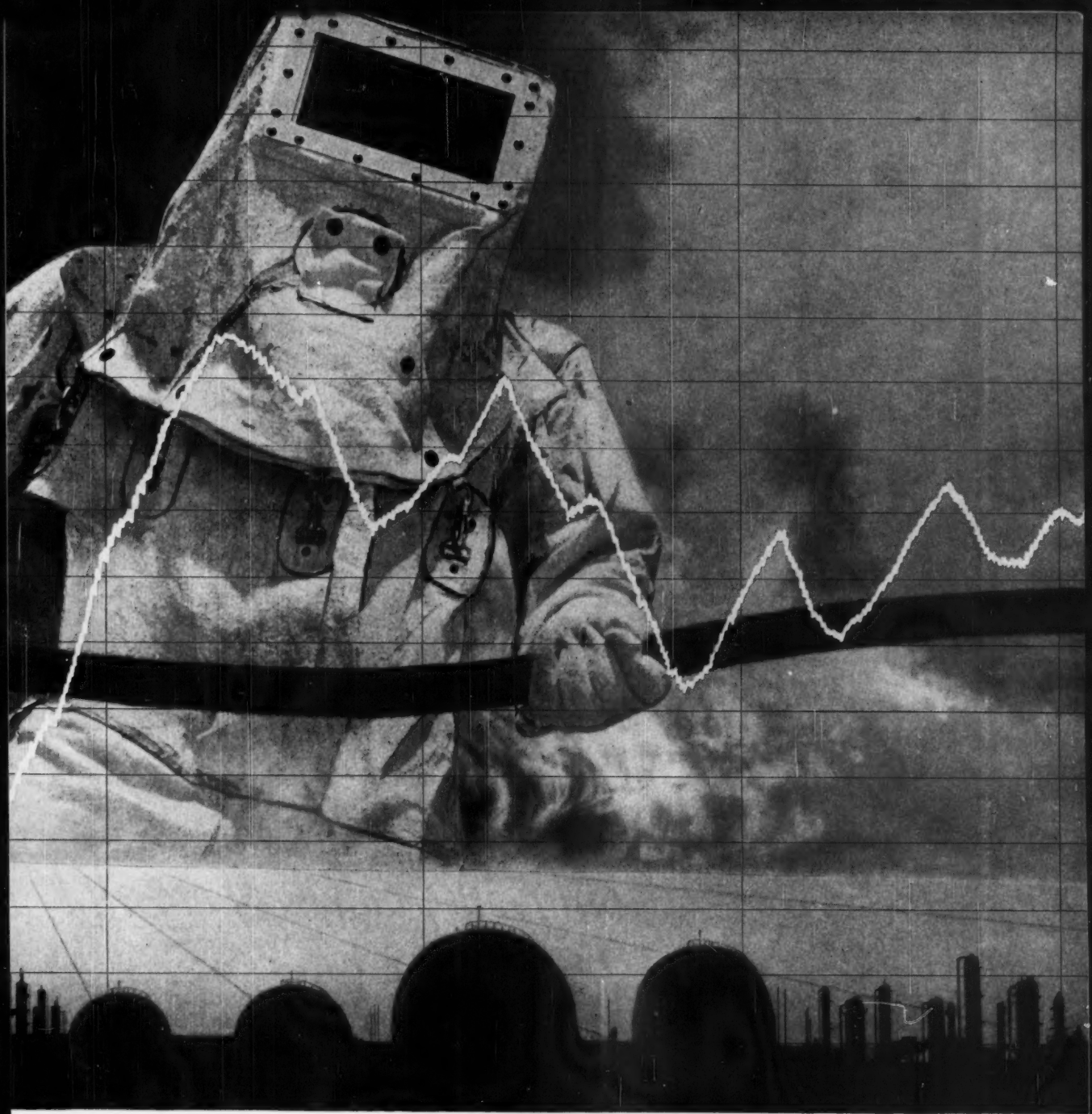


Celanese chemicals make heat

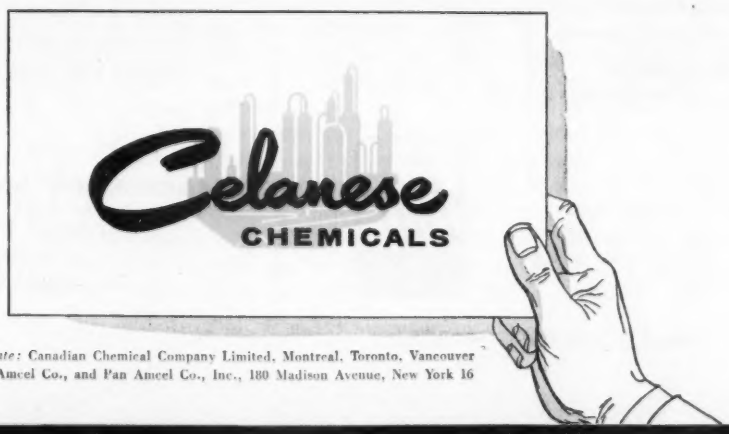
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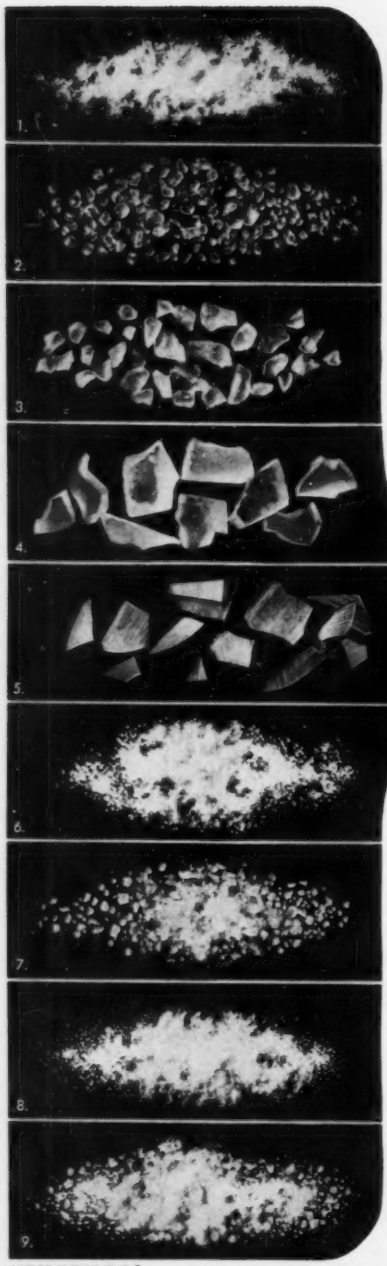
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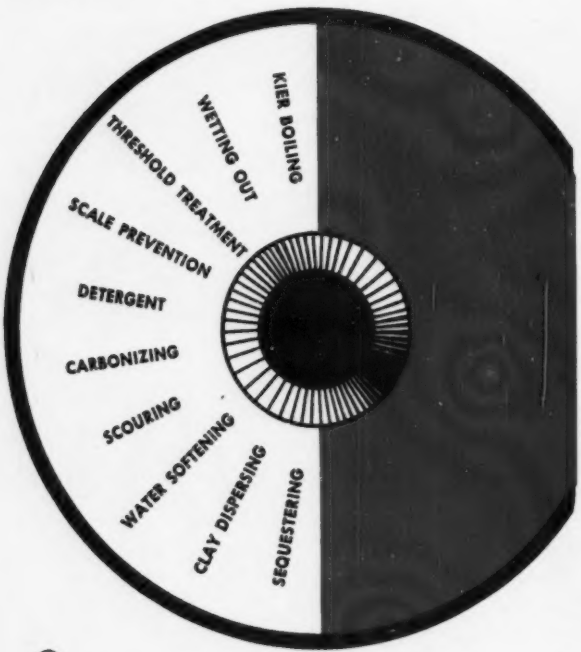


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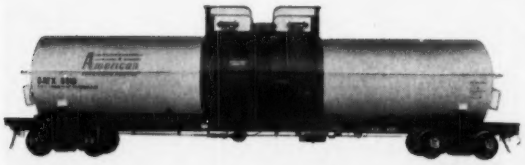
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Until this new low-temperature tank car lumbered onto West Coast rails recently, bulk shipping of liquid anhydrous hydrochloric acid was a fond hope. Now, after successful trials, it's reality.

● Significance: potential big-volume purchasers no longer need to locate near hydrochloric acid producers for 'over-the-fence' delivery of anhydrous material.

Anhydrous Hydrochloric Takes to the Rails

During the past few weeks, four novel tank cars like the one shown above have pioneered a new way to ship liquid anhydrous hydrochloric acid in bulk. For American Chemical Co. (Watson, Calif.) these first-ever rail shipments solve some pressing delivery problems. But more broadly, they are convincing evidence that potential big-volume anhydrous users need no longer hook onto hydrochloric pipelines; and that smaller-volume consumers may also benefit, by getting lower cost anhydrous.

It's no secret that major hydrochloric producers, users are closely watching American's efforts. Right now, these shipments are by special permit from the Interstate Commerce Commission. But it is clear American will apply for a permanent approval after its test program is finished. Stiffest test for the new cars, American says, will come next month, when they roll for hundreds of miles in the hot California sun.

The hot sun gives a severe test, because liquid anhydrous hydrochloric acid is pumped into the new tank cars under high pressure and at temperatures between —50 and —60 F. To keep the acid from vaporizing, the heavily insulated cars are equipped with two internal tanks of liquid carbon dioxide, which is sprayed directly into the acid tank, in metered quantities needed to keep the hydrochloric in the —50 F range.

Long-term Interest: Although these novel tank cars are spanking new, the idea is not. In fact, chemical shippers have been interested in rail-shipping this material since the mid-30's, according to the Assn. of American Railroads and several car manufacturers.

These tank cars weren't made before because of the high cost of building safe vehicles. Anhydrous hydrochloric is not corrosive—at least not until it picks up some moisture. But it has a great affinity for water, and because of its dehydrating effect, is dangerous to living things.

Largely for these reasons, few attempts have been made to ship the acid in bulk. Instead, tonnage users have built their facilities near producers to get material by pipeline—or else they've produced their own. (Examples: Pennsalt pipelines anhydrous at Calvert City, Ky; Stauffer at Louisville, Ky; and Hooker at Montague, Mich.)

And smaller-volume users buy their anhydrous in steel cylinders (sizes from 57 lbs. to 1 ton) although they often pay between $600-1,100/-ton (30-55¢/lb.) for it in these containers. Some consumers get their anhydrous in "tube trailers"—trucks that have gas cylinders permanently mounted in a horizontal position. Until recently, hydrochloric sent this way cost about 25¢/lb. even via trailers holding up to 11,000 lbs. Not long ago, however, Stauffer Chemical Co. announced a price cut to 15¢/lb. for purchasers who take 100,000 lbs./-year or more. Moreover, Stauffer soon will be shipping anhydrous in new, larger trailers holding up to 18,000 lbs. of acid. Stauffer, incidentally, is half owner (with Richfield Oil) of American Chemical.

But despite these ways of shipping anhydrous, American Chemical — when it decided to bring in more capacity for its various chlorination processes—decided to push for the cheaper tank car shipment.

Designing the Car: American, along with its parents Stauffer and Richfield, selected General American Transportation Co. (GATX), one of the nation's leading rail car makers, to design and build the cars.

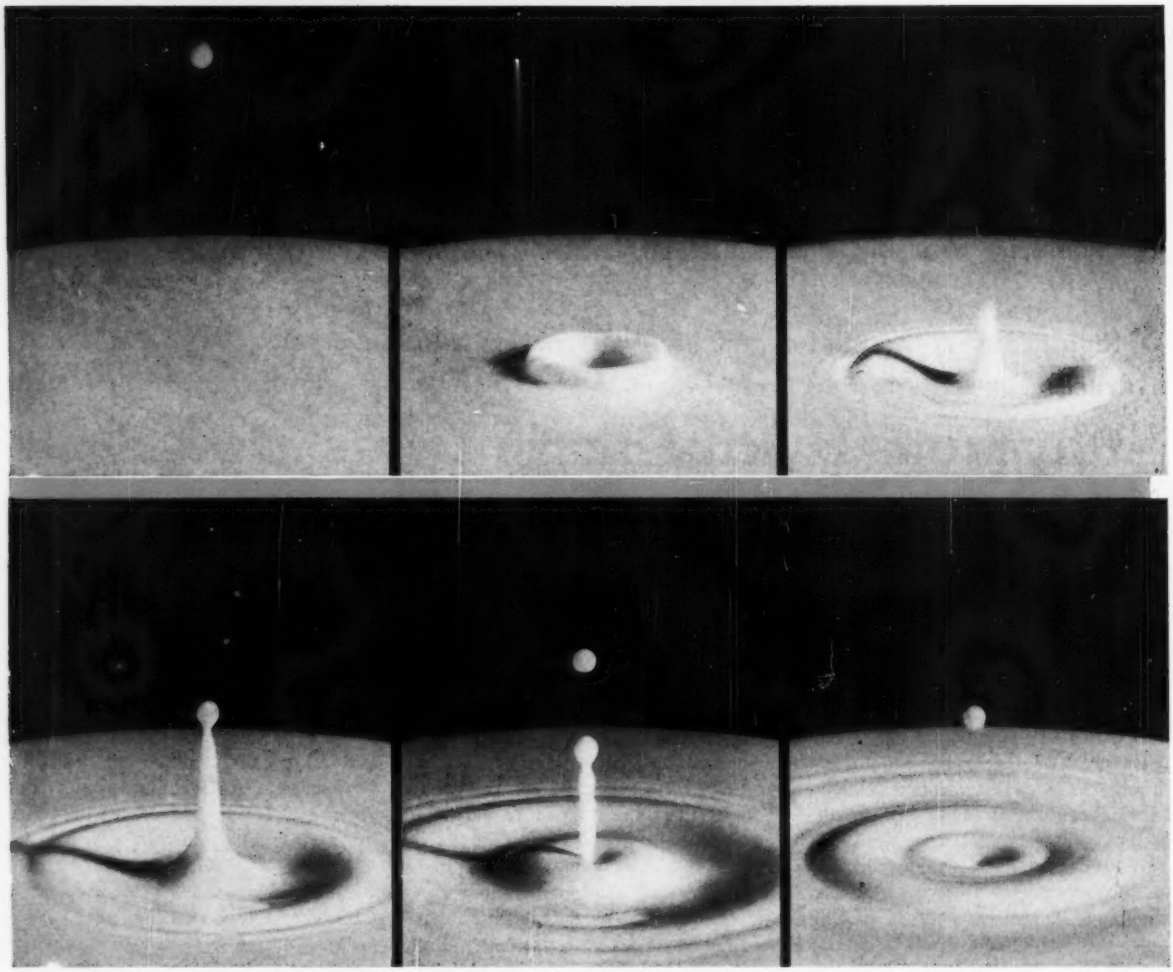
The car GATX came up with embodies a feature never used before on a tank car: it contains two carbon dioxide tanks (capacity: 730 lbs.) within the main acid-containing vessel.

This design was chosen to avoid venting the hazardous anhydrous hydrochloric to the atmosphere. GATX installed a system that monitors temperature and pressure rise inside the tank and automatically sets off a metered spray of liquid carbon dioxide to cool the contents by its vaporization. And GATX insulated the car with a 10-in. layer of polystyrene foam blocks, placed between the twin steel shells of the car.

Car capacity is 12,600 gal. of anhydrous (89,300 lbs.). Each car costs $32,000, compared with the tab of $10-11,000 for conventional tank cars, and it rents for $450/month, on a ten-year lease. The new cars are rated for 600 psi. working pressures—highest such ratings given any U.S.-made tank cars.

Car Problems: But in its move to ship anhydrous hydrochloric acid over the rails, American encountered its share of problems. For one thing, the steel strike disrupted GATX's

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building schedule. Thus the new cars were delayed several months, forcing American to make a few shipments of the acid in 10,000-gal. carbon dioxide cars. With each of these shipments, the company sent a man to travel with the cars, deal with any problems. But none arose.

Reportedly, American had additional difficulties persuading other companies on the tank-car committees of the A.A.R. and the Manufacturing Chemists' Assn. to approve its project. Few others have been anxious to see American proceed with its plan, and none willing to try the same thing. Yet, many of these same companies have watched American's development and test work with great interest, have been particularly curious about it during recent weeks.

Focus of their curiosity: the carbon dioxide system. Only American knows, or will know, just how important the emergency cooling apparatus is. But some companies that are evaluating similar cars may seek acid capacity of 13,500 gal. by reducing the size of the carbon dioxide tanks. This would, of course, cut even further the cost of shipping anhydrous by tank car.

But when it comes to actual shipping costs, American is noncommital. According to the company, it's still too early to gauge them accurately.

Apparently, numerous other firms are now interested in the new scheme, figure it is economically attractive. Dow Chemical Co., a producer of anhydrous hydrochloric, admits it has been checking all aspects of bulk acid transportation. It adds that it's Canadian subsidiary, Dow Chemical of Canada, Ltd. "will have anhydrous hydrochloric acid available for sale in tank-car lots."

Reportedly, Dow has no equipment for such shipments. But four more of the GATX anhydrous cars were shipped, just this week, to GATX's Canadian subsidiary, Canadian General Transit, Ltd.

And apparently GATX sees big things ahead for the cars, based on its prediction that it will be operating a fleet of 100 or more of the new cars not too many years in the future.

Looking Ahead: While it may be too early to say the new cars are thoroughly tested and ready for all types of anhydrous service, early indications seem to be encouraging.

Opinions vary as to how much anhydrous business will ever move by tank car. GATX, of course, is optimistic. And some observers believe that big-volume users may be eager to break free of the dependence on pipelines for the acid.

On the other hand, numerous hydrochloric acid sales managers told CHEMICAL WEEK that their market surveys show too little potential high-volume business to warrant tank-car shipments. And, they point out, most customers do not have storage facilities for tank-car quantities of hydrochloric.

Clearly, it will be some time before these questions are resolved. But, the consensus is that tank-car shipments will contribute valuable new flexibility to anhydrous movement, likely provide some savings to users who can handle tank-car lots.

Food Additives Manual

A new manual on food additives will soon be available to industry. Already, the first section (12 pp.) of the projected seven-part "Food Additives Manual" has been published by the Manufacturing Chemists' Assn. Price: 50¢.

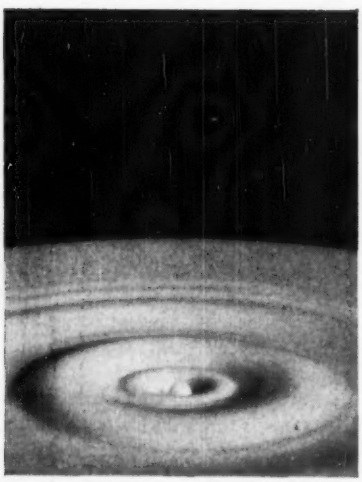
The section now mailing (which actually is part four) deals with actions required by companies in complying with the U.S. Food Additives Amendment of Sept. 6, '58. Among the subjects covered: how to determine whether a substance is subject to the amendment, how to propose a regulation for a food additive and what other courses of action may be possible or necessary.

Parts 1-3, which will be published later this year, discuss, respectively, federal laws regarding foods in interstate commerce; the Federal Food, Drug and Cosmetic Act, as amended, and the Food Additives Amendment of '58.

The remaining sections, parts 5-7, likely will be available late this year, will cover, respectively, general discussion on food additives, packaging, insecticides and the organization of the Food and Drug Administration; state laws on food additives and foreign laws on the subject.

Part 4 was released first because it deals specifically with actions required of manufacturers of chemicals, foods and packaging materials.

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*For complete product data see catalog unit in the BUYERS' GUIDE ISSUE of 1959-60

SALES

Deepening Channels

Chemical companies with production and distribution facilities in the Southwest can look forward to continuing improvements in waterways serving their area.

Army Engineers have authorized additional funds for deepening and widening the Houston Ship Channel. Their plans call for deepening from the current 36 ft. to 40 ft., and widening the 300-ft. waterway to 400 ft.

The Engineers will also spend some $1.2 million realigning and easing bends in the channel, as part of the long-range program.

At the Guadalupe River Channel, which provides access to the intracoastal waterway for Du Pont's Victoria Works and Union Carbide's Seadrift plant, work is progressing some two years ahead of schedule. When complete in '62, this channel will be 35 mi. long, 100 ft. wide and nine ft. deep.

DATA DIGEST

• **Reagent Chemicals:** New price list has prices and package sizes for wide range of reagent chemicals. Among those listed: enzymes, proteins, antibiotics, purines, pyrimidines and related compounds, vitamins, rare sugars and derivatives, miscellaneous organic and biochemical compounds. Krishell Laboratories, Inc. (1735 S.E. Powell Blvd., Portland 2, Ore.).

• **Grease Glossary:** New folder defines a series of 52 terms used by people in the grease industry. Cost: 25¢. National Lubricating Grease Institute (4638 J.C. Nicholas Parkway, Kansas City 12, Mo.)

• **Biocide:** Data sheet describes use of wide-spectrum biocide (microorganism killer) useful in oil wells, water injection systems, water disposal systems. Hagan Chemicals & Controls, Inc. (Hagan Center, Pittsburgh 30, Pa.).

• **Polyalkylene Glycols:** New 52-page booklet presents basic property and use data on 32 types of polyalkylene glycol synthetic fluids and lubricants. Data covered: physical and physiological properties, chemical and physical analytical methods. Some uses given: solvents for inks and dyes, antifoam agents, plasticiz-

ers, cosmetic components, chemical intermediates and hydraulic fluids. Union Carbide Chemicals Co., division of Union Carbide Corp. (270 Park Ave., New York).

• **Cyclobutane Derivatives:** Report describes the properties and reactions of tetramethyl-1,3-cyclobutanedione and its reduction product, 2,2,4,4-tetramethyl-1,3-cyclobutanediol. Both these chemicals are available in semi-commercial quantities, but their derivatives are not. Eastman Chemical Products, Inc. (Kingsport, Tenn.).

• **Ion Exchange:** Two reprints provide discussion of water treatment methods. Ion-exchange methods are discussed in No. 84, and other problems (scale, corrosion and microbial growth) are outlined in No. 88. Nalco Chemical Co. (6216 W. 66th Place, Chicago, Ill.).

• **Fluorocarbon Plastics:** New 4-page folder describes properties of conventional tetrafluoroethylene resins and of newer fluorinated ethylene, propylene polymers. Industrial Plastic and Equipment Co. (116 Main St. Orange, N.J.).

• **Metals:** Booklet presents price and property data for fabricated metal products. Also included: physical and chemical properties of numerous alloys such as Nionel, Monel, Iconel, Iconoly, glass-sealing alloys and stainless steels. Techalloy Co., Inc. (Rahns, Pa.).

• **Soybean Lecithin:** Two folders outline uses of soybean lecithins in various emulsifying and dispersing applications. Among them: rubber processing, automotive specialty chemicals, plastics and cosmetics. Spencer Kellogg and Sons, Inc. (Buffalo 5, N.Y.).

• **Radioactive Compounds:** Latest price list for radioactive compounds lists over 375 substances. Among them: 17 new tritium compounds, 16 new short-lived isotope-labeled materials, 69 new carbon-14 tagged compounds. New England Nuclear Corp. (575 Albany St., Boston 18, Mass.).

• **Glass Polishing:** New 8-page brochure provides data on uses for cerium oxide in polishing glass and plastics. Vitro Chemical Co. (342 Madison Ave., New York 17).

• **Castable Ceramic:** Data sheet describes properties, uses and casting procedure for slurry of ceramic fibers and inorganic binder. Research and Development Division, The Carborundum Co. (Niagara Falls, N.Y.).

Tracers

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Calcium Carbide—Israeli Manufacturer interested to contact importer or agent. Contact Office of Israel Trade Commissioner, 250 W. 57th St., New York 19, N.Y. Tel: CI-5-1215.

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Buflovak 700 sq. ft. single effect forced circu-lation evaporator, T304 SS. Perry Equipment Corporation, 415 N. Sixth St., Phila. 22, Pa.

Buflovak 5' x 30' Rotary vacuum dryer, T316 SS, jacketed, ASME, late model. Perry Equipment Corp., 1415 N. Sixth St., Phila. 22, Pa.

Struthers-Wells 3,500 gal. T316 SS Jacketed reactor, 40/20 HP paddle agitator, int. coils. Perry, 1415 N. Sixth St., Phila. 22, Pa.

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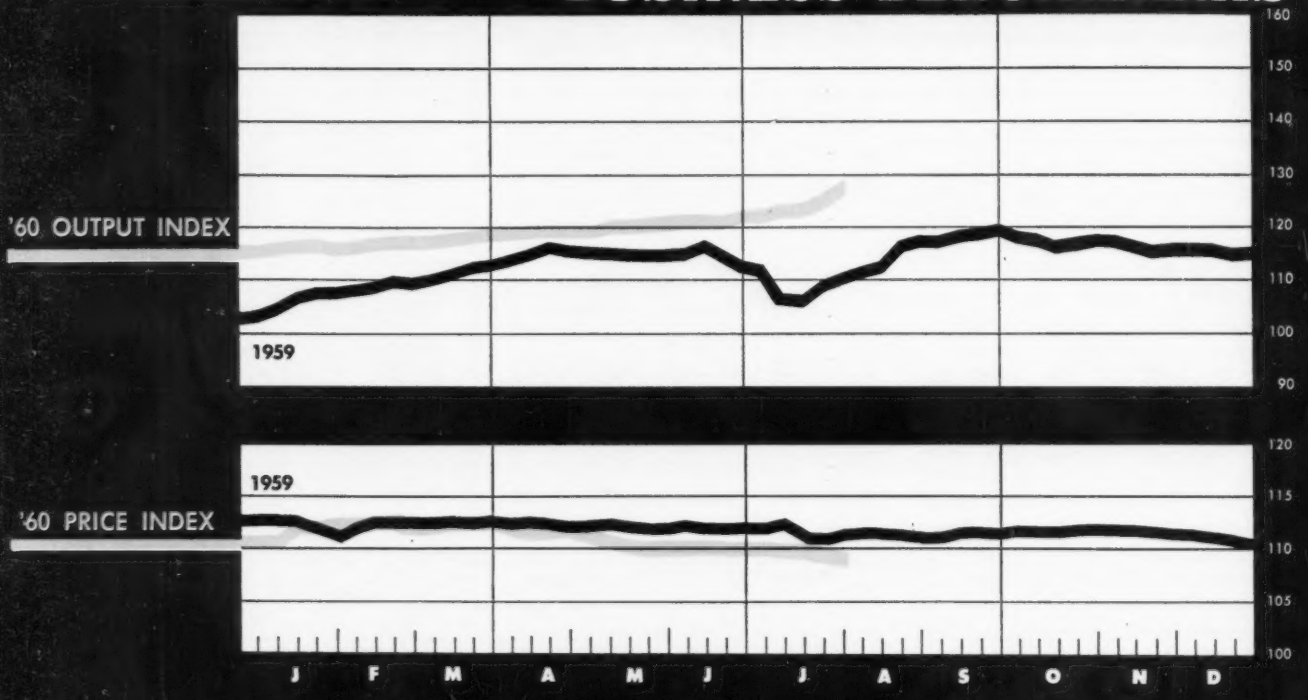
EQUIPMENT WANTED

Wanted Rotary Vacuum Dryer or Ribbon Blend-er—Horizontal 125# ASME, coded jacket, approximately 1,200 gallons or 160 cu. ft. capacity. Helical ribbon. Steel or stainless steel considered. Please send details and asking price to W-4574, Chemical Week.

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BUSINESS BENCHMARKS

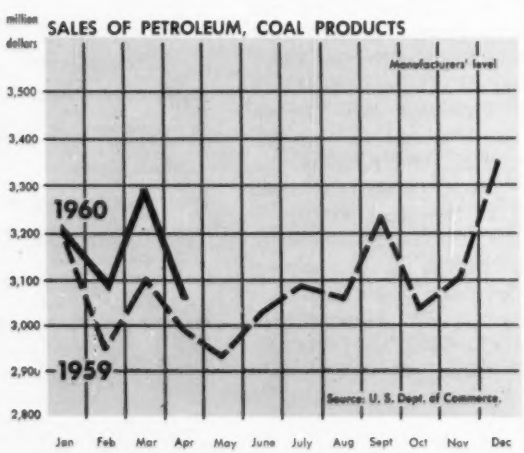


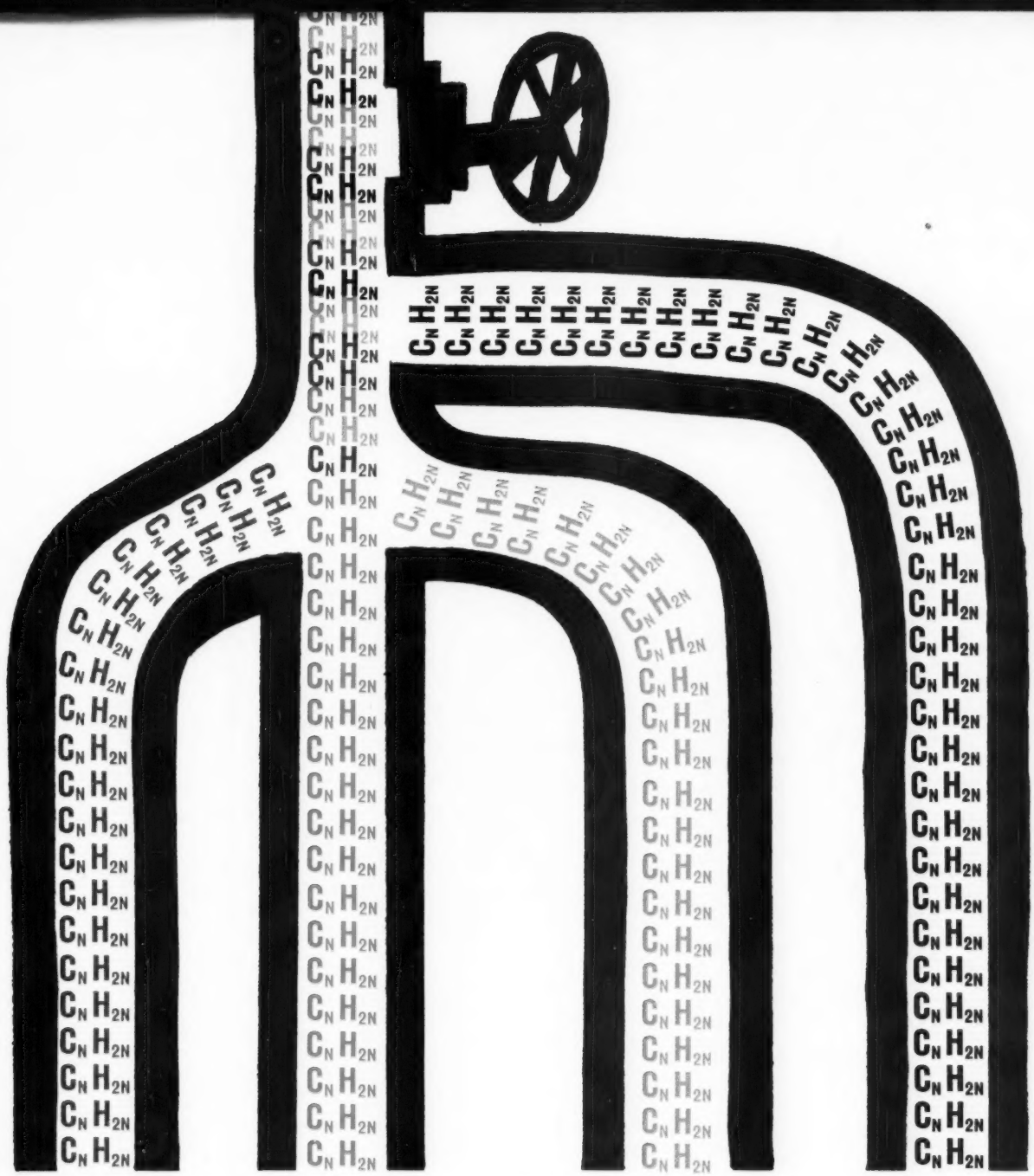
WEEKLY BUSINESS INDICATORS	*Latest Week*	*Preceding Week*	*Year Ago*
Chemical Week output index (1957=100)	126.4	125.0	109.9
Chemical Week wholesale price index (1947=100)	106.9	107.1	111.0
Stock price index (12 firms, Standard & Poor's)	48.83	50.16	59.78
Steel ingot output (thousand tons)	1,556	1,476	365
Electric power (million kilowatt-hours)	14,208	13,031	13,415
Crude oil and condensate (daily av., thousand bbls.)	6,832	6,831	6,858

MONTHLY INDICATORS—Trade (million dollars)	Manufacturers' Sales			Manufacturers' Inventories		
	Latest Month	*Preceding Month*	*Year Ago*	*Latest Month*	*Preceding Month*	*Year Ago*
All manufacturing	31,034	31,029	30,742	55,000	54,657	51,599
Chemicals and allied products	2,357	2,383	2,089	4,106	4,075	3,730
Petroleum and coal products	3,205	3,264	2,994	3,340	3,351	3,380
Paper and allied products	1,031	1,030	1,026	1,583	1,551	1,482
Textile products	1,276	1,259	1,310	2,698	2,719	2,487

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NEW, Safer, Lighter, Smaller 13-Gallon Acid Carboy

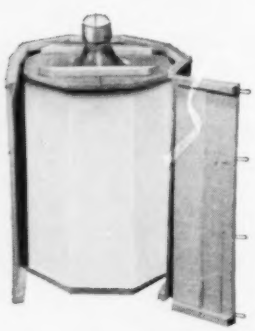
cushioned with *expanded polystyrene* overpack

General Chemical packaging research has done it again! This time with a new carboy for 13-gallon acid bottles that has just won the 1960 "Best of Show" award from the Society of Packaging and Handling Engineers. Here is a commercial acid carboy that cushions the bottle completely with foamed-in-place *expanded polystyrene* . . . also has the added protection of an octagonal wire–bound wooden shell. Look at these outstanding advantages:

- **Safer!** New *expanded polystyrene* overpack resists shock . . . cushions bottle in shipping and handling.
- **Lighter!** 40% less tare weight.
- **Smaller!** Increases shipping and storage capacity by 30-35%.

This revolutionary new 13-gallon acid carboy is now going into expanded production and will be available soon from most production and stock points. Call your nearest General Chemical office for full details and information on availability in your area.

New Acid-Bottle Protection
Underneath the rugged, wire-bound wooden outer shell, inch-thick, foamed-in-place *expanded polystyrene* protects General Chemical's 13-gallon acid bottle.



Basic to America's Progress

Allied Chemical

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